Engine/Emissions-Diagnosis
1989 Shop Manual

Volume H Car/Truck

Ford

ATTENTION!

SERVICE MANAGERS AND SERVICE TECHNICIANS

This is your master Engine/Emission Diagnosis Manual for the 1989 model year. This looseleaf binder will be updated with supplements to cover any new componentry as well as any changes or modifications to existing systems and components.

The first sub tab in the binder is for special Specifications Bulletins; periodic issues of TSB'S which provide performance specifications (approximately three mailings per year).

In order to properly diagnose and service engine/emissions components, it is imperative that this manual be kept up-to-date with change packages and the special TSB's and, that the manual is available to service technicians who perform this type of diagnosis and service.

Ford Parts and Service Division

These Are The Tabs For The ENGINE/EMISSIONS DIAGNOSIS MANUAL

FORM NUMBER
FPS-12106-89H

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PART I — EMISSION SYSTEMS

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1989 CAR / TRUCK SHOP MANUAL

Engine/Emissions Diagnosis

Ford Parts and Service Division
Training and Publications Department

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September, 1988

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Important Safety Notice

Appropriate service methods and proper repair procedures are essential for the safe, reliable operation of all motor vehicles as well as the personal safety of the individual doing the work. This Shop Manual provides general directions for accomplishing service and repair work with tested, effective techniques. Following them will help assure reliability.

There are numerous variations in procedures, techniques, tools, and parts for servicing vehicles, as well as in the skill of the individual doing the work. This Manual cannot possibly anticipate all such variations and provide advice or cautions as to each. Accordingly, anyone who departs from the instructions provided in this Manual must first establish that he compromises neither his personal safety nor the vehicle integrity by his choice of methods, tools or parts.

Notes, Cautions, and Warnings

As you read through the procedures, you will come across NOTES, CAUTIONS, and WARNINGS. Each one is there for a specific purpose. NOTES give you added information that will help you to complete a particular procedure. CAUTIONS are given to prevent you from making an error that could damage the vehicle. WARNINGS remind you to be especially careful in those areas where carelessness can cause personal injury. The following list contains some general WARNINGS that you should follow when you work on a vehicle.

- Always wear safety glasses for eye protection.
- Use safety stands whenever a procedure requires you to be under the vehicle.
- Be sure that the ignition switch is always in the OFF position, unless otherwise required by the procedure.
- Set the parking brake when working on the vehicle. If you have an automatic transmission, set it in PARK unless instructed otherwise for a specific operation. If you have a manual transmission, it should be in REVERSE (engine OFF) or NEUTRAL (engine ON) unless instructed otherwise for a specific operation. Place wood blocks (4" × 4" or larger) to the front and rear surfaces of the tires to provide further restraint from inadvertent vehicle movement.
- Operate the engine only in a well-ventilated area to avoid the danger of carbon monoxide.
- Keep yourself and your clothing away from moving parts, when the engine is running, especially the fan and belts.
- To prevent serious burns, avoid contact with hot metal parts such as the radiator, exhaust manifold, tail pipe, catalytic converter and muffler.
- Do not smoke while working on a vehicle.
- To avoid injury, always remove rings, watches, loose hanging jewelry, and loose clothing before beginning to work on a vehicle.
- Keep hands and other objects clear of the radiator fan blades. The electric cooling fan on the Escort can start to operate at any time by an increase in underhood temperature, even though the ignition is in the OFF position. Other vehicles with an electric cooling fan can start at any time for the same reason, but only when the ignition switch is in the RUN position, Therefore, care should be taken to ensure that the electric cooling fan motor is completely disconnected when working under the hood.

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Foreword

This 1989 Car Shop Manual provides information covering Emissions for all 1989 Ford Motor Company Passenger Cars and Trucks manufactured in the United States and Canada. Complete emissions related diagnostic procedures for all affected systems or components are covered in this manual.

The descriptions and specifications contained in this manual were in effect at the time this manual was approved for printing. Ford Motor Company reserves the right to discontinue models at any time, or change specifications or design without notice and without incurring obligation.

For service information on specific vehicle lines for Body, Chassis and Electrical; Powertrains; and/or Pre-Delivery, Maintenance and Lubrication, refer to the Passenger Car and Truck Cross Index pages in the front of this manual.

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Passenger Car Cross Reference Index

Vehicle Lines	Content
Lincoln Town Car, Ford Crown Victoria/Mercury Grand Marquis	Body, Chassis, Electrical, Powertrain, Maintenance, Lubrication
Mark VII	Body, Chassis, Electrical, Powertrain, Maintenance, Lubrication
Thunderbird/Cougar	Body, Chassis, Electrical, Powertrain, Maintenance, Lubrication
Mustang	Body, Chassis, Electrical, Powertrain, Maintenance, Lubrication
Tempo/Topaz, Escort	Body, Chassis, Electrical, Powertrain, Maintenance, Lubrication
Taurus/Sable	Body, Chassis, Electrical, Powertrain, Maintenance, Lubrication
Continental	Body, Chassis, Electrical, Powertrain, Maintenance, Lubrication
All Models	Pre-Delivery
All Car & Truck Models	Engine/Emissions Diagnosis

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Truck
Cross Reference Index

Manual	Content	Vehicle Lines
A	Body, Chassis, Electrical	Bronco, Econoline (E-150 through E-350) (F-150 through F-350)
B	Engine	Bronco, Econoline (E-150 through E-350) (F-150 through F-350)
D	Body, Chassis, Electrical	F-, FT, B-, C-600 through 8000 Series
E	Engine	F-, FT, B-, C-600 through 8000 Series
F	Pre-Delivery, Hoisting and Jacking	All Truck Series
	Engine/Emissions Diagnosis	All Car & Truck Models

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What's New In This Manual

The following is a list of the modifications to this manual for 1989.

New or Modified Applications

- 2.3L EFI Distributorless Ignition (DIS) Dual-plug Ranger
- 3.0L SEFI SHO Taurus / Sable
- 3.8L SEFI Supercharged (SC) Thunderbird / Cougar
- 3.8L SEFI AXOD Continental / Taurus / Sable
- 3.8L SEFI Thunderbird / Cougar
- 5.8L EFI, 7.3L Diesel, and 7.5L E / F Series Truck with Electronically Controlled Transmission (E4OD)

Resistance and Voltage Charts

- For Several Engine Operating Conditions

Self-Test Code Definition Charts

- For Each Engine Application

EEC Pinpoint Test Revisions

- Component Base Part Numbers Added
- Wire Colors Added to Schematics
- Self-Test Code Definitions
- List of Possible Causes at Test Entry

EEC-IV Monitor Box and Recorder Diagnostics Available

- Instructions and Diagnostic Procedures Are Available as a Separate Slip-In Section for this Volume.

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USING THE MANUAL

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ENGINE/EMISSIONS DIAGNOSIS

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ENGINE/EMISSIONS DIAGNOSIS

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How To Use This Manual

Special Notes:

- This manual is designed to diagnose gasoline and diesel engine systems.
- In each case, begin diagnosis with Section 2, Diagnostic Routines. Section 2 defines the probable causes of the vehicle's symptoms. It functions as a checklist to ensure that all potential causes are reviewed.
- If a diagnostic procedure does not find the solution to a vehicle symptom, it is important to return to Section 2 to review all other possible causes of the symptom.
- Refer to Section 3 for component descriptions and part numbers.
- Component locations can be found in the Electrical and Vacuum Trouble-Shooting Manuals (EVTM's).
- The Sections in Part II, EEC-IV Diagnostics, are interrelated and should be used in conjunction with each other.

Do

- Refer to Section 1, Emission Control Identification/Application, to identify the emission components on the vehicle. For vehicles with diesel engines, refer to Sections 19 and 20.
- Begin diagnosis with the Diagnostic Routines in Section 2.
- Read all special notes.
- Prevent any unsafe or hazardous conditions by following the notes, cautions and warnings listed at the beginning of this book.
- After service, always verify that the repair corrected the customer complaint.

Don't

- Skip from Section to Section.

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Contents

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Glossary

The glossary is a list of technical terms or acronyms and their definitions. It is not intended to be a dictionary of components and their functions. If you desire a detailed description of a specific component, refer to Section 3, Emission Related Components, in this manual.

4X4L: 4X4 Low input switch.

A4LD: Automatic 4-Speed Lock-up-converter Drive.

A/C: Air Conditioning.

ACC: A/C Clutch Compressor signal input to the EEC-IV processor relating status of the A/C clutch.

ACCS: A/C Cycling Switch.

A/C P: A/C Pressure Cut-out switch.

A/C DV: Air Cleaner Duct and Valve motor.

ACL: Automatic Adjustable Shock Controller.

A/CL BIMET: Air Cleaner Bimetal sensor.

ACD: Air Conditioner Demand switch.

ACT: Air Charge Temperature sensor or its signal circuit.

ACV: (Thermactor) Air Control Valve.

AHFSS: Air Condition/Heater Function Select Switch input to the EEC-IV processor relating status of the A/C heater function select switch.

AIR BPV: (Thermactor) Air Bypass Valve.

AM1: Thermactor Air Management 1 (TAB).

AM2: Thermactor Air Management 2 (TAD).

AMBIENT TEMPERATURE: Temperature of air surrounding an object e.g., temperature where vehicle is being worked on.

ANTI-BFV: Anti-Backfire Valve.

A/T: Automatic Transmission.

AVOM: Analog Volt-Ohm Meter.

AXOD: Automatic Transaxle Overdrive.

AXOD-E: Automatic Transaxle Overdrive, Electronically Controlled.

BASE IDLE: Idle RPM determined by throttle lever hardset on throttle body while Idle Speed Control is fully retracted and disconnected.

BATT: Battery

BOB: (Breakout Box) An EEC-IV test device which connects in series with the processor and the EEC-IV harness and permits measurements of processor inputs and outputs.

BOO: Brake On-Off input to the EEC-IV processor indicating a braking drive mode.

BOOST: Turbo charger boost solenoid or its control circuit.

BP: Barometric Pressure sensor or its signal circuit.

BV: Bowl Vent (Carburetor Fuel Bowl)

BVT: Back Pressure Variable Transducer.

CANP: Canister Purge solenoid or its control circuit.

CATALYST: A muffler-like device in the exhaust system containing a monolithic substrate (a ceramic honeycomb structure) that is coated with catalytic metals such as platinum or palladium. When hot exhaust gases come in contact with these metals a chemical reaction takes place to consume unburned hydrocarbon, carbon monoxide and nitrous oxides.

CBD: Closed Bowl Distributor.

CCC: Converter Clutch Control solenoid or its control circuit.

CCD: Computer Controlled Dwell.

CCO: Converter Clutch Override output from the EEC-IV processor to the transmission.

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CCS: Coast Clutch Solenoid or its control circuit.

CES: Clutch Engage Switch.

CFI: (Central Fuel Injection) A computer controlled fuel metering system which sprays atomized fuel into a throttle body mounted atop the intake manifold.

CHECK ENGINE LIGHT: A dash panel light used either to aid in the identification and diagnosis of EEC system problems or to indicate that maintenance is required on non-EEC equipped vehicles.

CID: Cylinder Identification sensor or its signal circuit.

CLC: Converter Lock-up Clutch.

CLUTCH: Clutch engagement switch or its control circuit.

COC: Conventional Oxidation Catalyst.

COMPUTER TIMING: The total spark advance in degrees before top dead center. Calculated by the EEC-IV processor based on input from a number of sensors.

CURB IDLE: Computer controlled Idle RPM.

CWM: Cold Weather Modulator.

DCL: Data Communications Link.

DFS: Decel Fuel Shut-off.

DIS: Distributorless Ignition System.

DOL: (Data Output Link) Fuel calculation data from the EEC-IV processor to the electronic tripminder.

DPDIS: Dual Plug Distributorless Ignition System.

DPH: Dual Plug Head.

DPI: Dual Plug Inhibit.

DV: Delay Valve.

DVOM: Digital Volt-Ohm Multimeter that displays voltage or resistance measurements in digital form on a liquid crystal display (LCD).

DV TW: Delay Valve Two-Way.

E4OD: Electronic 4-Speed Overdrive transmission.

ECA: Electronic Control Assembly.

ECT: Engine Coolant Temperature sensor or its signal circuit.

EDF: Electro-Drive Fan relay or its control circuit.

EEC: (Electronic Engine Control) A computer controlled system of engine control.

EEGR: Electronic EGR Valve (Sonic).

EFI: (Electronic Fuel Injection) A computer controlled fuel system that distributes atomized fuel through an injector located in each intake port of the engine. The fuel injectors are fired using bank-to-bank circuitry.

EGO: Exhaust Gas Oxygen sensor or its signal circuit.

EGOG: EGO Ground.

EGR: Exhaust Gas Recirculation system designed to allow the flow of inert exhaust gases into the combustion chamber to cool the combustion and thus reduce nitrous oxides in the exhaust.

EGR S/O: EGR Shut Off.

EGRC: EGR Control vacuum solenoid valve or its control circuit.

EGRV: EGR Vent vacuum solenoid valve or its control circuit.

EHC: Exhaust Heat Control vacuum solenoid valve or its control circuit.

ERS: Engine RPM Sensor or its signal circuit.

EVP: EGR Valve Position sensor or its signal circuit.

EVR: EGR Vacuum Regulator solenoid or its control circuit.

FBC: (Feedback Carburetor) An MCU or EEC-IV controlled fuel system employing a stepper motor or a dithering solenoid that controls fuel/air mixture by bleeding air into the main and idle systems of the carburetor.

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FCS: Fuel Control Solenoid or its control circuit.

FI: Fuel Injector or its control circuit.

FIPL: Fuel Injection Pump Lever sensor or its signal circuit.

FMEM: Failure Mode Effects Management.

FP: Fuel Pump relay or its control circuit.

FPM: (Fuel Pump Monitor) A circuit in the EEC system used to monitor the electric fuel pump operation on some EEC-IV equipped vehicles.

FTO: (Filtered Tach Output) An output from the DIS TFI-IV module which provides a filtered ignition signal to the processor in order to control dwell.

FUEL RICH/LEAN: A qualitative evaluation of air/fuel ratio based on an A/F value known as stoichiometry or 14.7. In the EEC-IV system rich/lean is determined by a voltage signal from the EGO sensor. An excess of oxygen (lean) is an EGO voltage of less than .4 volts, a rich condition is indicated by an EGO voltage of greater than .6 volts.

FWD: Front Wheel Drive.

GND or GRND: A common ground circuit for all vehicle power.

HALL EFFECT: A process where current is passed through a small slice of semi-conductor material at the same time as a magnetic field to produce a small voltage in the semi-conductor.

HBV: Heater Blower Voltage input to the EEC-IV processor reflecting heater blower voltage demand.

HEDF: High speed Electro-Drive Fan relay or its control circuit.

HEGO: Heated EGO sensor or its signal circuit.

HEGOG: Heated EGO Ground.

HIC: Hot Idle Compensator.

HLOS: (Hardware Limited Operation Strategy) Certain types of computer malfunction will place the EEC-IV processor into HLOS mode. Output commands are replaced with fixed values.

HO: High Output.

HSC: High Swirl Combustion.

IAS: Inlet Air Solenoid valve or its control circuit.

IBP: Integral Back Pressure.

IDLE LIMITER: A device to control minimum and maximum idle fuel richness. The idle limiter is intended to prevent unauthorized persons from making overly rich idle adjustments.

IDM: (Ignition Diagnostics Monitor) A continuous monitor of the ignition input to the EEC-IV processor used to detect intermittent ignition faults.

IGN: Ignition circuit or system.

IMS: (Inferred Mileage Sensor) A circuit using an E-cell which deflates its state with the application of a current. As the vehicle ages (in terms of key on time) the EEC-IV processor compensates for aging of the vehicle by changing calibration parameters.

INJ: Injector (Fuel).

INJ GND: Injector Ground (Fuel).

ISC: (Idle Speed Control) Currently there are two types of computer controlled idle speed control: D.C. motor ISC and air bypass ISC.

ITS: Idle Tracking Switch.

KAM: (Keep Alive Memory) A series of vehicle battery powered memory locations in the microprocessor which allows the microprocessor to store input failures identified during normal operation for use in later diagnostic routines and adapts some calibration parameters to compensate for changes in the vehicle system.

KAPWR: Keep Alive Power.

KS: Knock Sensor or its signal circuit.

L: Liters.

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LUS: Lock Up Solenoid.

MAF: Mass Air Flow Sensor or its signal circuit.

MAP: Manifold Absolute Pressure sensor or its signal circuit.

MCU: Microprocessor Control Unit.

MIL: (Malfunction Indicator Light) An electric circuit between the EEC-IV processor and the CHECK ENGINE light on the dash panel of EEC-equipped vehicles.

MLP: Manual Lever Position sensor or its signal circuit.

Monitor Box: An optional EEC-IV test device which connects in series with the EEC-IV processor and its harness, and permits measurements in various units of processor inputs and outputs.

M/T: Manual Transmission

NDS: Neutral Drive Switch and its signal circuit.

NGS: Neutral Gear Switch or its signal circuit.

NPS: Neutral Pressure Switch or its signal circuit.

OCC: Output Circuit Check.

OCT: Octane Switch.

OCT ADJ: Octane Adjust device which modifies spark advance.

OHC: Overhead Cam.

OPEN CIRCUIT: A circuit which does not provide a complete path for the flow of current.

OSC: Output State Check.

OVERLAY CARD: A plastic card used with the Monitor box to identify EEC-IV signals for each engine. The card also programs the monitor for auto mode measurements.

PCV: (Positive Crankcase Ventilation) A system which controls the flow of crankcase vapors into the engine intake manifold where they are burned in combustion rather than being discharged into the atmosphere.

PFE: Pressure Feedback EGR sensor or its signal circuit.

PIP: (Profile Ignition Pickup) a "hall effect" vane switch that furnishes crankshaft position data to the EEC-IV processor.

PSPS: (Power Steering Pressure Switch) An EEC-IV processor input to regulate idle speed based on power steering load demand.

PULSE AIR SYSTEM: Part of the emission control system that utilizes a reed-type check valve which allows air to be drawn into the exhaust system as a result of exhaust pulses.

PVS: Ported Vacuum Switch.

PWR GND: Power Ground.

QUICK TEST: A functional diagnostic test of the EEC system consisting of vehicle preparation and hookup, Key On Engine Off, Engine Running and Continuous self-tests.

RECORDER: An optional EEC-IV test device which works jointly with the Monitor box. It allows up to 8 EEC-IV signals to be electronically recorded over a 50 second period.

RELAY: A switching device operated by a low current circuit which controls the opening and closing of another circuit of higher current capacity.

RELIEF VALVE: A pressure limiting valve located in the exhaust chamber of the thermactor air pump. It functions to relieve part of the exhaust airflow if the pressure exceeds a calibrated value.

RWD: Rear Wheel Drive.

SBS: Supercharger Bypass Solenoid or its control circuit.

SEFI: (Sequential Electronic Fuel Injection) Port fuel injection triggered off ignition timing that fires each injector separately.

SELF-TEST: One of three subsets of the EEC Quick Test: Key On Engine Off, Engine Running, and Continuous.

SDV: Spark Delay Valve.

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SHED: Sealed Housing Evaporative Determination System.

SHORT CIRCUIT: An undesirable connection between a circuit and any other point.

SIG RTN: Signal Return circuit for all sensor signals except HEGO.

SIL: (Shift Indicator Light) A system that provides a visual indication to the driver of a vehicle when to shift to the next higher gear to obtain optimum fuel economy.

SOLENOID: A wire coil with a moveable core that changes position by means of electro-magnetism when current flows through the coil.

SPOUT: Spark Output Signal from the EEC-IV processor.

SS1: Shift Solenoid 1 or its control circuit.

SS2: Shift Solenoid 2 or its control circuit.

SS 3/4-4/3: (Shift Solenoid 3/4-4/3) Output from the EEC-IV processor to the transmission that selects 3rd and 4th gears.

STAR: (Self-Test Automatic Readout) A testing device in which the EEC and MCU systems output service codes in a digital format.

STI: Self Test Input circuit in the EEC and MCU systems used to initiate self test.

STO: Self Test Output circuit in the EEC and MCU systems that transmits service codes (pulses) to either a VOM or star tester.

SVO: Special Vehicle Operations.

TAB/TAD: Thermactor Air Bypass/ Thermactor Air Diverter vacuum solenoid valves or their control circuits.

TCP: Temperature Compensated (Acceleration) Pump.

TFI: (Thick Film Ignition) Distributor mounted module comprised of a custom integrated circuit, Darlington output device and associated thick film integrated components.

TGS: (Top Gear Switch) A lock out mechanism that prevents the SIL from lighting when the vehicle is in top gear.

THERMACTOR: A system for injection of air into the exhaust system to aid in the control of hydrocarbon and carbon monoxides in the exhaust.

THERMACTOR II: See Pulse Air System.

THS: Transmission Hydraulic Switch.

THS 3/2: Transmission Hydraulic Switch - 3rd/2nd gear.

THS 4/3: Transmission Hydraulic Switch - 4th/3rd gear.

TIMING: Relationship between spark plug firing and piston position usually expressed in crank shaft degrees before (BTDC) or after (ATDC) top dead center of the compression stroke.

TIV: Thermactor Idle Vacuum Valve.

TK: Throttle Kicker vacuum solenoid valve or its control circuit.

TOT: Transmission Oil Temperature Sensor or its signal circuit.

TP: Throttle Position sensor or its signal circuit.

TSP: Throttle Solenoid Positioner.

TTS: Transmission Temperature Switch.

TVS: Temperature Vacuum Switch.

TVV: Thermal Vent Valve.

TWC: Three Way Catalyst.

VAF: Vane Air Flow sensor or its signal circuit.

VAT: Vane Air Temperature sensor or its signal circuit.

VBAT: Vehicle Battery voltage.

VCK-V: Vacuum Check Valve.

VCV: Vacuum Control Valve.

VDV: Vacuum Delay Valve.

VM: Vane Meter.

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VOM: Volt-Ohm Meter used to measure voltage and resistance. Readings are indicated by sweep hand on a printed scale rather than a digital display.

VOTM: Vacuum Operated Throttle Modulator.

VPWR: Vehicle Power supply voltage regulated to 10-14 volts.

VR/S: Vacuum Regulator/Solenoid.

VRDV: Vacuum Retard Delay Valve.

VREF: Reference voltage supplied by the EEC-IV processor to some sensors and regulated to 4-6 volts.

VRESER: Vacuum Reservoir.

VREST: Vacuum Restrictor.

VRV: Vacuum Regulator Valve.

VSC: Vehicle Speed Control sensor or its signal circuit.

VSS: Vehicle Speed Sensor or its signal circuit.

VVA: Venturi Vacuum Amplifier.

VVC: Variable Voltage Choke relay or its control circuit.

VVV: Vacuum Vent Valve.

WAC: Wide-open throttle A/C Cutoff.

WOT: Wide-Open Throttle.

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SECTION 1

Emission Control Identification/Application

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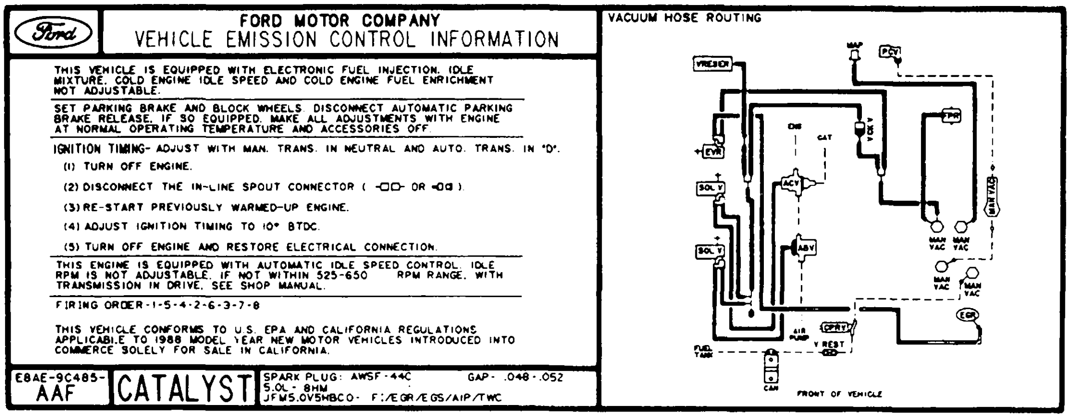
Emission Control Identification/Application

VEHICLE EMISSION CONTROL INFORMATION

Each vehicle is equipped with a decal (Fig. 1) containing emission control data that applies specifically to that vehicle and engine. The specifications provided on the decal are critical to servicing emissions systems.



A9426-A

Figure 1 Typical Vehicle Emission Control Information Decal

In addition to the tune-up specifications and procedures, the emission decal shows a color coded schematic of the engine vacuum system. The color coding on the schematic represents the actual color coding on the vacuum hoses. However, there will be instances where an individual hose color will not agree.

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Emission Control Identification/Application

VEHICLE EMISSION CONTROL INFORMATION DECAL LOCATION

VEHICLE	LOCATION
Escort 1.9L	Radiator Sight Shield
Tempo/Topaz 2.3L	Radiator Sight Shield
Mustang 2.3L, 5.0L	Coil Appearance Cover
Merkur 2.3L Turbo	Radiator Sight Shield
Thunderbird/Cougar 3.8L	Radiator Support
Taurus/Sable 2.5L, 3.0L, 3.8L	Radiator Sight Shield
Continental 3.8L	Radiator Sight Shield
Crown Victoria Grand Marquis 5.0L, 5.8L	Fan Shroud
Mark VII, Town Car 5.0L	Fan Shroud
Ranger, F-Series, Bronco/Bronco II, Aerostar 2.3L, 2.8L, 2.9L, 3.0L, 4.9L, 5.0L, 5.8L, 6.1L, 7.0L, 7.5L	Radiator Support
Econoline All Engines	Under Hood

Engine Calibration Identification

The Emission Calibration Number Label, which contains the engine calibration number, is located on the driver's side door or door post pillar.

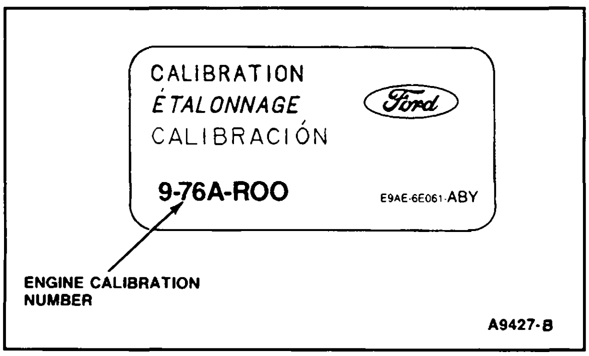

Figure 2 Emission Calibration Number Label

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Emission Control Identification/Application

EMISSION CONTROLS APPLICATION

PASSENGER CAR — 50 STATES/CANADA

Engine	Vehicle Application	Catalyst(s)		Fuel System Type, Mfg	Electronic Eng Ctrl	EGR System	Secondary Air System	Ignition System	Idle Speed Control
		Type	Location						
1.9L	Escort	TWC	Close Mount	CFI	EEC-IV	PFE	None	TFI-IV	DCM
1.9L HO	Escort	TWC COC	DBUB	EFI	EEC-IV	BVT	Dual PA	TFI-IV	BPA
2.3L OHC	Mustang	TWC TWC	TB UB	EFI	EEC-IV	EEGR	None	TFI-IV	BPA
2.3L OHC Turbo	Merkur	TWC	DBUB	EFI	EEC-IV	Ported	None	TFI-IV	BPA
2.3L HSC 50 States	Tempo/Topaz	TWC COC	DBUB	EFI	EEC-IV	PFE	PA	TFI-IV	BPA
2.3L HSC Plus	Tempo/Topaz	TWC COC	DBUB	EFI	EEC-IV	PFE	PA	TFI-IV	BPA
2.5L HSC	Taurus	TWC COC	DBUB	CFI	EEC-IV	EEGR	PA	TFI-IV	DCM
3.0L	Taurus	TWC	UE	EFI	EEC-IV	None Calif-PFE	None	TFI-IV Calif-TFI-IV/CCD	BPA
3.0L SHO	Taurus/Sable	TWC	UE	SEFI-MA	EEC-IV	None Calif-PFE	None	DIS	BPA
3.8L SC	Thunderbird/ Cougar	(2) TWC TWC	TB	SEFI-MA	EEC-IV	PFE	None	DIS	BPA
3.8L	Thunderbird/ Cougar	(2) TWC TWC	TB	SEFI	EEC-IV	PFE	None	TFI-IV/ CBD	BPA
	Continental	(2) TWC TWC	TB UB	SEFI	EEC-IV	PFE	CT	TFI-IV/ CBD	BPA
	Taurus/Sable	(2) TWC TWC	TB UB	SEFI	EEC-IV	PFE	CT	TFI-IV/ CBD	BPA
5.0L	Crown Victoria Grand Marquis Ford Police Town Car	(2) TWC (2) COC	TB UB	SEFI	EEC-IV	EEGR	MTA	TFI-IV	BPA
5.0L HO	Mustang	(2) TWC (2) COC	TB UB	SEFI-MA	EEC-IV	EEGR	MTA	TFI-IV	BPA
	Mark VII	(2) TWC (2) COC	TB UB	SEFI	EEC-IV	EEGR	MTA	TFI-IV	BPA
5.8L	Crown Victoria Grand Marquis (Canada) Ford Police	(2) TWC COC	DBUB	7200-VV FBC, Ford	MCU	IBP	MTA	DS II	TSP

ABBREVIATIONS:

BPA = Bypass Air
BVT = Back Pressure Variable Transducer
CBD = Closed Bowl Distributor
CCD = Computer Controlled Dwell
CFI = Central Fuel Injection
COC = Conventional Oxidation Catalyst
CT = Conventional Thermactor
DBUB = Dual Brick Underbody
DCM = D.C. Motor
DIS = Distributorless Ignition System
DS-II = Duraspark II
EEC-IV = Electronic Engine Control — System-IV
EEGR = Electronic EGR Valve (Sonic)
EFI = Electronic Fuel Injection
EGR = Exhaust Gas Recirculation
HO = High Output
HSC = High Swirl Combustion
IBP = Integral Back Pressure
MA = Mass Air
MCU = Microprocessor Control Unit
MFG = Manufacturer
MTA = Managed Thermactor Air
OHC = Overhead Cam
PA = Pulse Air
PFE = Pressure Feedback Electronic
SEFI = Sequential EFI
TB = Toe Board
TFI = Thick Film Ignition
TSP = Throttle Solenoid Positioner
TWC = Three-Way Catalyst
UB = Underbody
UE = Under Engine
UIC = Universal Ignition Control
VV = Variable Venturi

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Emission Control Identification/Application

EMISSION CONTROLS APPLICATION

LIGHT TRUCK — 50 STATES/CANADA

Engine	Vehicle Application	Catalyst(s) Type	Catalyst(s) Location	Fuel System Type, Mfg	Electronic Eng Ctrl	EGR System	Secondary Air System	Ignition System	Idle Speed Control
2.3L OHC	Ranger	TWC TWC	DBUB	EFI	EEC-IV	EEGR	None	DIS	BPA
2.9L	Ranger/ Bronco II	TWC TWC	(2) SBUB	EFI	EEC-IV	None	None	TFI-IV	BPA
3.0L	Aerostar	TWC TWC	(2) SBUB	EFI	EEC-IV	None	None	TFI-IV	BPA
4.9L	E-Series/ F-Series Bronco	TWC (2) COC	UB #1 UB #2	EFI	EEC-IV	EEGR	MTA/ AM1, AM2	TFI-IV	BPA
5.0L	E-Series/ F-Series Bronco	TWC (2) COC	UB #1 UB #2	EFI	EEC-IV	EEGR	MTA/ AM1, AM2	TFI-IV	BPA
5.8L	E-Series/ F-Series Bronco	TWC (2) COC	UB #1 UB #2	EFI	EEC-IV	EEGR	MTA/ AM1, AM2	TFI-IV	BPA

ABBREVIATIONS:

AM1, AM2 = Air Management 1, 2
BPA = Bypass Air
COC = Conventional Oxidation Catalyst
CT = Conventional Thermactor
DBUB = Dual Brick Underbody
DCM = D.C. Motor
DIS = Distributorless Ignition System
DS-II = Duraspark II
EEC-IV = Electronic Engine Control — System-IV
EEGR = Electronic EGR Valve (Sonic)
EFI = Electronic Fuel Injection
MTA = Managed Thermactor Air
NFB = Non-Feedback Carburetor
PFE = Pressure Feedback Electronic
SBUB = Single Brick Underbody
TFI = Thick Film Ignition
TWC = Three-Way Catalyst
UB = Underbody

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Emission Control Identification/Application

EMISSION CONTROLS APPLICATION

MEDIUM/HEAVY TRUCK — 50 STATES/CANADA

Engine	Vehicle Application	Catalyst(s) Type	Catalyst(s) Location	Fuel System Type, Mfg	Electronic Eng Ctrl	EGR System	Thermactor System	Ignition System	Idle Speed Control
4.9L	E-Series/ F-Series	TWC COC	UB #1 UB #2	EFI	EEC-IV	EEGR	MTA/ AM1, AM2	TFI-IV	BPA
5.8L	E-Series/ F-Series	REDOX	UB	EFI	EEC-IV	EEGR	MTA/ AM1, AM2	TFI-IV	BPA
6.1L	B-Series F-Series	None	NA	2380EG-2V Holley	None	Ported	CT	DS-II	None
7.0L	B-Series F-Series (49 states)	None	NA	4190EG-4V Holley	None	Ported	CT	DS-II	None
7.5L	E-Series/ F-Series	(4) REDOX	UB	EFI	EEC-IV	EEGR	MTA	TFI-IV/ CBD	BPA

ABBREVIATIONS:

AM1, AM2 = Air Management 1, 2
BPA = Bypass Air
CBD = Closed Bowl Distributor
COC = Conventional Oxidation Catalyst
CT = Conventional Thermactor
DS-II = Duraspark II
EEC-IV = Electronic Engine Control — System-IV
EEGR = Electronic EGR Valve (Sonic)
EFI = Electronic Fuel Injection
EGR = Exhaust Gas Recirculation
MFG = Manufacturer
MTA = Managed Thermactor Air
NA = Not Applicable
REDOX = Reduction-Oxidation
TFI = Thick Film Ignition
TWC = Three-Way Catalyst
UB = Underbody
V = Venturi

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SECTION 2

Diagnostic Routines

Contents

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Diagnostic Routines

PREFACE

The Diagnostic Routines list the components and systems that can contribute to a particular condition in the order of probability, ease of accomplishment, and accessibility. These Routines can be used as check lists for reference in the event of unusual or infrequent causes of malfunction.

It is not necessary that any given order be followed, but it makes good sense for the technician to visually inspect everything that his experience tells him could be the source of the condition before beginning a more involved diagnosis. The effectiveness of every service must be validated.

All references, under the REFERENCE column in each Diagnostic Routine chart, are as follows:

- Group numbers reference a group number shown in the Powertrain, or Body, Chassis and Electrical Shop Manuals.
- Section numbers reference a section in the Engine/Emissions Diagnosis manual.
- Special manual publications are referenced in some cases.

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Diagnostic Routine Index

GASOLINE ENGINES

DIESEL ENGINES

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Diagnostic Routines

201 CRANKS NORMALLY BUT WON'T START

NOTE: Extended cranking, because of a "No Start" condition, can load the exhaust system with raw fuel, which can ruin the catalytic converter after the engine starts. After the "No Start" condition has been repaired, disconnect the thermactor air supply, run the engine until surplus fuel is used up and reconnect the thermactor air supply.

System	Component	Reference
EEC	Quick Test	Section 14
Ignition	Electrical Connections Secondary Ignition Wires Spark Plugs Fouled Ignition Switch <u>DSII and TFI IV:</u> Ignition Coil Ignition Module Rotor Alignment Distributor Cap, Adapter, Rotor & Stator <u>DIS:</u> Single or Dual Hall Crankshaft Sensors Hall Camshaft Sensor DIS Ignition Module (Low Data Rate) DIS Coil(s)	Section 13, Group 23 and *Group 3 Section 14, Section 13, Group 23 and *Group 3
Fuel Delivery	Filter Pump Water/Dirt/Rust Contamination in Fuel Lines Tank (Fuel Supply) Dual Tanks (Selector Switch) Sender Filter Fuel Pressure Regulators for EFI and CFI Injectors Inertia Switch	Visual, Section 3, Section 11 (for fuel delivery systems and EFI/CFI fuel pressure regulators), Section 14 (for electric pumps), Group 24, and *Group 10
Basic Engine	Camshaft Timing Compression	Group 21 and *Group 3
External Carburetor/Fuel Charging Assy./Throttle Body	Electrical Connections Choke Plate and Linkage Cold Enrichment Rod and Linkage (7200) Venturi Valve (7200) Throttle Linkages	Visual, Section 4, Group 24 and *Group 3
Internal Carburetor	Float/Inlet Needle and Seat Idle Air Bleeds and Fuel Passages	Section 4, Group 24 and *Group 3
EGR	Valve	Section 6
MCU	Component Diagnostics	Special MCU Diagnosis Manual

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Diagnostic Routines

202 STARTS NORMALLY BUT WON'T RUN (STALLS)

System	Component	Reference
External Carburetor/Fuel Charging Assy/Throttle Body	Electrical and Vacuum Connections Fast Idle Speed Choke Plate and Linkage Cold Enrichment Rod And Linkage (7200) Choke Pulldown Adjustment & Diaphragm Venturi Valve (7200) Choke Cap Indexing	Visual, Section 4, Group 24 and *Group 3
Ignition	Electrical Connections Secondary Ignition Wires Ignition Switch <u>DSII AND TFI IV:</u> Ignition Coil Ignition Module Rotor Alignment Distributor Cap, Adapter, Rotor & Stator Ballast Resistor	Section 13, Group 23 and *Group 3
	<u>DIS:</u> Single or Dual Hall Crankshaft Sensors Hall Camshaft Sensor DIS Ignition Module (Low Data Rate) DIS Coil(s)	Section 14, Section 13, Group 23 and *Group 3
EGR	Valve	Section 6
Fuel Delivery	Filter Pump Water/Dirt/Rust Contamination in Fuel Lines Tank (Fuel Supply) Sender Filter Fuel Pressure Regulators for EFI and CFI Injectors Inertia Switch	Visual, Section 3, Section 11 (for fuel delivery systems and EFI/CFI fuel pressure regulators), Section 14 (for electric pumps), Group 24 and *Group 3
EEC	Quick Test	Section 14
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Internal Carburetor	Float/Inlet Needle and Seat Idle Air Bleeds and Fuel Passages	Group 24 and *Group 3
Exhaust	Component (Restricted)	Section 5
Basic Engine	Camshaft and Valve Train	Group 21 and *Group 3

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Diagnostic Routines

203 CRANKS NORMALLY BUT SLOW TO START

NOTE: It is a good practice to confirm that the correct starting procedure was being used by the customer before proceeding with diagnosis.

System	Component	Reference
External Carburetor/Fuel Charging Assy/Throttle Body	Electrical and Vacuum Connections Choke Plate and Linkage Cold Enrichment Rod and Linkage (7200) Choke Cap Indexing Accelerator Pump Venturi Valve (7200) Bowl Vents	Visual, Section 4, Group 24 and *Group 3
Fuel Delivery	Filter Pump Water/Dirt/Rust Contamination in Fuel Lines Fuel Pressure Regulators for EFI and CFI Sender Filter Injectors	Visual, Section 3, Section 11 (for fuel delivery systems and EFI/CFI fuel pressure regulators), Section 14 (for electric pumps), Group 24 and *Group 10
Internal Carburetor	Float/Inlet Needle and Seat Stepper Motor (7200) Cold Enrichment System (7200)	Visual, Section 3, Section 4, Group 24 and *Group 3
Ignition	Scope Engine for: Spark Plugs, Coil, Secondary Ignition Wires Spark Plugs Fouled <u>DSII AND TFI IV:</u> Distributor Cap, Adapter & Rotor	Visual, Section 13, Group 23 and *Group 3
	<u>DIS:</u> Single or Dual Hall Crankshaft Sensors Hall Camshaft Senso DIS Ignition Module (Low Data Rate) DIS Coil(s)	Section 14, Section 13, Group 23 and *Group 3
Induction and Vacuum Distribution	Vacuum Leaks Air Cleaner Element Restricted	Visual, Audible, Group 21, and *Group 3
Cooling	Electric Fan (Hot Start Only)	Group 27 and *Group 3
EGR	Valve	Section 6
PCV	Valve	Section 9
EVAP	Components	Section 7, Group 24 and *Group 3
EEC	Quick Test	Section 14
MCU	Component Diagnostics	Special MCU Diagnosis Manual

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Diagnostic Routines

204 ROUGH IDLE

System	Component	Reference
Cooling	Fan or Electric Fan (Loose or Cracked)	Visual
Vacuum Distribution	Vacuum Leaks	Visual and Audible
External Carburetor/Fuel Charging Assy/Throttle Body/Injectors	Curb or Fast Idle Speeds Electrical and Vacuum Connections Choke Plate and Linkage Cold Enrichment Rod and Linkage (7200) Venturi Valve (7200) Choke Pulldown Bowl Vent Fuel Pressure Regulators EFI/CFI Injectors Fuel Rail	Visual, Section 4, Section 11 (for fuel pressure regulator diagnosis), Group 24 and *Group 3
Ignition	Scope Engine For: Spark Plug, Coil, Secondary Wires, Distributor Cap, Adapter and Rotor	Section 13, Group 23 and *Group 3
Carburetor	Idle Mixture	Section 4
Internal Carburetor	Idle, Air Bleeds or Fuel Passages Float/Inlet Needle and Seat Stepper Motor (7200) Hot Idle Compensator (may be external) Altitude Compensator Cold Enrichment System (7200)	Visual, Section 3, Section 4, Group 24 and *Group 3
EGR	Valve Vacuum Regulator	Section 6
PCV	Valve	Section 9
EVAP	Components	Section 7, Group 24 and *Group 3
Ignition Timing	Base plus Advance and Retard Functions	Section 13
EEC	Quick Test	Section 14
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Turbocharger		Group 24
Exhaust	Pipes, Muffler, Catalyst Resonator, Heat Control Valve	Section 5
Basic Engine	Compression Valve Train Camshaft Intake Manifold Gaskets	Group 21 and *Group 3

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Diagnostic Routines

205 MISSES UNDER LOAD

System	Component	Reference
Ignition	Scope Engine For: Spark Plug, Coil, Secondary Wires, Distributor Cap, Adapter and Rotor	Section 13, Group 23 and *Group 3
EEC	Quick Test	Section 14
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Fuel Delivery	Filter Pump Lines Fuel Pressure Regulators EFI/CFI Sender Filter Injectors	Visual, Section 3, Section 4, Section 11 (for fuel delivery systems and EFI/CFI fuel pressure regulators), Section 14 (for electric pumps), Group 24 and *Group 10
External Carburetor/Fuel Charging Assy/Throttle Body	Electrical and Vacuum Connections Choke and Linkage Cold Enrichment Rod and Linkage (7200) Venturi Valves (7200)	Visual, Section 4, Group 24 and *Group 3
Internal Carburetor	Basic: Idle, Main, and Accelerator Pump Float/Inlet Needle and Seat Main Metering Fuel Enrichment	Visual, Section 3, Group 24 and *Group 3
Ignition Timing	Base plus Advance and Retard Functions	Section 13

206 LOW IDLE (STALLS ON DECEL OR QUICK STOP)

System	Component	Reference
External Carburetor/Fuel Charging Assy/Throttle Body	Curb or Fast Idle Speed Electrical and Vacuum Connections Throttle Devices Venturi Valve (7200)	Visual, Section 3, Section 4, Group 24 and *Group 3
EGR	Valve	Section 6
Internal Carburetor	Idle Airbleeds or Fuel Passages Stepper Motor (7200) Hot Idle Compensator (may be external) Float/Inlet Needle and Seat Cold Enrichment System (7200)	Visual, Section 3, Section 4, Group 24 and *Group 3
Turbocharger	Retard Switches	Group 24
EEC	Quick Test	Section 14
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Base Transmission (E4OD Only)	Transmission Oil Level Converter Clutch Control Solenoid	Group 17

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Diagnostic Routines

207 HESITATES OR STALLS ON ACCELERATION

System	Component	Reference
External Carburetor/Fuel Charging Assy/Throttle Body	Choke Plate and Linkage Electrical & Vacuum Connections Cold Enrichment Rod and Linkage (7200) Accelerator Pump Venturi Valve (7200)	Visual, Section 3 and Section 4
Induction and Vacuum Distribution	Vacuum Leaks	Visual and Audible
Induction	Air Cleaner Duct, Stove Pipe, and Valve	Section 8
Ignition	Scope Engine For: Spark Plug, Coil, Secondary Wires, Distributor Cap, Adapter and Rotor Ignition Timing	Section 13
External Carburetor/Fuel Charging Assy/Throttle Body	Curb or Fast Idle Speeds	Section 4, Group 24 and *Group 3
EGR	Valve	Section 6
Fuel Delivery	Filter Pump Water/Dirt/Rust Contamination in Fuel Lines Fuel Pressure Regulators for EFI and CFI Sender Filter Injectors	Visual, Section 3, Section 11 (for fuel delivery systems and EFI/CFI fuel pressure regulators), Section 14 (for electric pumps), Group 24 and *Group 10
Internal Carburetor	VV Diaphragm (7200) Power Valve Stepper Motor (7200) Main System	Section 3, Section 4, Group 24 and *Group 3
EEC	Quick Test	Section 14
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Turbocharger	Turbocharger Assembly	Group 24
Exhaust (Restriction)	With Backpressure EGR System	Section 5
Base Transmission (E4OD and A4LD)	Converter Clutch Control Solenoid Converter Clutch Override Converter Clutch	Group 17 and *Group 7

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Diagnostic Routines

208 BACKFIRE (INDUCTION OR EXHAUST)

System	Component	Reference
Vacuum Distribution	Vacuum Hoses, or Connections Leak(s)	Visual and Audible
Ignition	Scope Engine For: Spark Plug, Coil, Secondary Wires, Distributor Cap and Rotor, Crossed Wires Ignition Timing	Section 13
External Carburetor	Choke Plate and Linkage	Visual and Section 4
Basic Engine	Intake Manifold Gaskets Compression Check Camshaft Valves	Group 21 and *Group 3
Thermactor	Thermactor System Components	Section 10
Pulse Air	Pulse Air System Components	Section 10
EEC	Quick Test	Section 14
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Exhaust	Components (Restricted)	Section 5
Fuel Delivery	Filter Pump Water, Dirt, Rust, Contamination in Fuel Lines Fuel Pressure Regulators EFI/CFI Injectors Sender Filter	Visual, Section 3, Section 11 (for fuel delivery systems and EFI/CFI fuel pressure regulators), Section 14 (for Electric Pumps), Group 24 and *Group 10

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Diagnostic Routines

209 LACK OF POWER

System	Component	Reference
External Carburetor/Fuel Charging Assy/Throttle Body	Electrical and Vacuum Connections Choke Plate and Linkage Accelerator Pump Venturi Valves (7200)	Visual, Section 4, Group 24 and *Group 3
Ignition	Timing	Section 13
Induction	Air Cleaner Duct and Valve and Element	Section 8
Fuel Delivery	Filter Pump Lines Fuel Pressure Regulator EFI/CFI Sender Filter Injectors	Visual, Section 3, Section 11 (for fuel delivery systems and EFI/CFI fuel pressure regulators), Section 14 (for electric pumps), Group 24 and *Group 10
EGR	Valve	Section 6
Internal Carburetor	Float Inlet/Needle and Seat Accelerator Pump Main Metering System Fuel Enrichment Altitude Compensator Stepper Motor (7200) Pullover Rod Sticking (1949)	Visual, Section 3, Section 4, Group 24 and *Group 3
Basic Engine	Compression Check Camshaft Valves	Group 21 and *Group 3
Drive Train	Clutch, Automatic Transmission, Brakes	Groups 15, 16 and 17 *Groups 5 and 7
EEC	Quick Test	Section 14
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Turbocharger	Turbocharger Assembly	Group 24
Exhaust	Components (Restricted)	Section 5

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Diagnostic Routines

210 SURGE AT STEADY SPEED

System	Component	Reference
External Carburetor/Fuel Charging Assy (Throttle Body)	Choke Plate and Linkage Electrical & Vacuum Connections Venturi Valves (7200)	Visual, Section 4, Group 24 and *Group 3
Vacuum Distribution	Vacuum Leaks	Visual, Audible
Fuel Delivery	Filter Pump Lines Fuel Pressure Regulator EFI/CFI Sender Filter	Visual, Section 3, Section 11 (for fuel delivery systems and EFI/CFI fuel pressure regulators), Section 14 (for electric pumps), Group 24 and *Group 10
Internal Carburetor	Idle, Main Systems Float/Inlet Needle and Seat Fuel Enrichment Systems Altitude Compensator	Visual, Section 3, Section 4, Group 24 and *Group 3
EGR	Valve	Section 6
EEC	Quick Test	Section 14
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Turbocharger	Turbocharger Assembly	Group 24 and *Group 3
EVAP	Components	Section 7, Group 24 and *Group 3
Basic Engine	Valve Train and Camshaft Intake Manifold Gaskets	Group 21 and *Group 3
Thermactor	Thermactor System Components	Section 10
Ignition	Timing	Section 13

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Diagnostic Routines

211 HIGH IDLE (ENGINE DIESELS)

NOTE: If engine idles smoothly after being shut off, trouble is likely to be in the ignition switch, ignition harness, starter solenoid "IGN" tap, or EEC relay.

System	Component	Reference
External Carburetor/Fuel Charging Assy/Throttle Body	Curb or Fast Idle Speeds Electrical and Vacuum Connections Throttle Positioner or Dashpot Throttle Plate and Linkage Choke Plate and Linkage Fast Idle Linkage Venturi Valves (7200) Speed Control Chain	Visual, Section 3, Section 4, Group 24 and *Group 3
Vacuum Distribution	Vacuum Leaks	Visual and Audible
Cooling	Overheating	Routine 218
Induction	Vacuum Leaks	Group 21 and *Group 3
Base Transmission (E4OD Only)	Coast Clutch Solenoid (starts at 3rd gear)	Group 17
EEC (E4OD Only)	Quick Test	Section 14

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Diagnostic Routines

212 ENGINE NOISE

<table>
<tr><th>System</th><th>Component</th><th>Reference</th></tr>
<tr><td>Squeal, Click, or Chirp</td><td>Oil Level (low)
Valve Train
Drive Belts (loose)
Belt Driven Components
EEC Solenoids</td><td rowspan="3">Visual, Audible, Section 3, Group 21, *Group 3, Group 27 and *Group 3</td></tr>
<tr><td>Rumble, Grind</td><td>Belt Driven Components</td></tr>
<tr><td>Rattle</td><td>Component (loose)</td></tr>
<tr><td rowspan="3">Hiss</td><td>Thermactor System (leak)
Vacuum Distribution System (leak)
Induction System (leak)
Spark Plug (loose)</td><td>Visual, Audible, Section 10, Group 21 and *Group 3</td></tr>
<tr><td>Cooling System (leak)</td><td>Visual and Audible</td></tr>
<tr><td>EVAP System (leak)</td><td>Section 7</td></tr>
<tr><td>Snap</td><td>Secondary Ignition</td><td>Visual and Audible</td></tr>
<tr><td>Rap, Roar</td><td>Exhaust System (leak)
Pulse Air System (air cleaner)</td><td>Visual, Audible, Section 5, and Section 10</td></tr>
<tr><td>Whine</td><td>Turbocharger (some whine is normal)</td><td>Audible</td></tr>
<tr><td rowspan="3">Knock</td><td>Connecting Rod Bearing (worn)
Main Bearing (worn)
Piston Pin (loose)
Piston to Bore Clearance (cold engine)</td><td>Group 21 and *Group 3</td></tr>
<tr><td>Fuel Pump</td><td>Group 24 and *Group 10</td></tr>
<tr><td>Detonation</td><td>Routine 215</td></tr>
</table>

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Diagnostic Routines

213 POOR FUEL ECONOMY

NOTE: Since fuel consumption is drastically increased for city driving, short-run operation, stop and go driving, trailer towing, extended winter warm-up periods, etc., as opposed to "trip" mileage, an attempt should be made to determine these factors when confronted with "poor mileage" conditions. However, since the operator is not always at fault, the following is appended:

System	Component	Reference
External Carburetor/Fuel Charging Assy/Throttle Body	Choke Plate and Linkage Cold Enrichment Rod and Linkage (7200) Electrical & Vacuum Connections Fuel Pressure Regulators EFI/CFI	Visual, Section 4 and Section 11
Induction	Air Cleaner Duct and Valve Air Cleaner Element (Restricted)	Section 8
Ignition	Scope Engine For: Spark Plug, Coil, Secondary Wires, Distributor Cap, Adapter and Rotor Ignition Timing	Section 13
Internal Carburetor	Idle, Main Systems Enrichment Systems Float/Inlet Needle and Seat	Section 4, Group 24 and *Group 3
EEC	Quick Test	Section 14
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Fuel Delivery	Fuel Return Line Blocked	Group 24 and *Group 10
Cooling	Thermostat	Group 27 and *Group 3
Factors External to the Engine	Tire Pressure & Type Clutch Operation Converter Clutch Override Automatic Transmission Shift Pattern and Fluid Level Brake Drag Exhaust System Speedometer/Odometer Gear Ratio Axle Ratio Vehicle Load Road & Weather Conditions	Manual and Visual
Base Transmission (E4OD Only)	Converter Clutch Control Solenoid	Group 17

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Diagnostic Routines

214 HIGH OIL CONSUMPTION

NOTE: If the condition cannot be verified, clean engine, if necessary, change oil and filter (at customer's expense), seal and have customer drive 500 miles (804.5 Km) or enough distance to consume two quarts before returning for re-examination.

System	Component	Reference
External Leaks	Rocker Cover Gasket, Crankshaft Seals, Engine Assembly	Visual
Proper Dipstick	Overfilling (sometimes accomplished by the "short stick" gas station procedure).	Manual and Visual
Induction	Air Cleaner Element (Sealing)	Visual, Group 24 and *Group 3
PCV	Valve	Section 9
Turbocharger	Compressor/Turbine Bearing, Seals, Center Drain, Etc.	Visual and Group 24
Internal Leaks (blue smoke from tailpipe)	Valve Guides Valve Stem Seals Intake Manifold and Gasket Cylinder Head Drain Passages Piston Rings	Group 21 and *Group 3

215 SPARK KNOCK/PINGING

NOTE: If the above fails to correct the condition, it is recommended that the owner change his source of fuel and use higher octane fuel.

System	Component	Reference
EGR	Verifiy correct application, then diagnose.	Section 6
Induction	Air Cleaner Duct and Valve Assembly	Section 8
Vacuum Distribution	Vacuum Leaks Spark Delay Valve PVS	Visual, Audible, and Section 3
Basic Engine	Oil Level Compression Check Intake Manifold Gasket	Group 21 and *Group 3
Cooling	Overheating	Routine 218
EEC	Quick Test	Section 14
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Turbocharger	Turbocharger Assembly	Group 24
Thermactor	Thermactor System Components	Section 10
Ignition	Timing	Section 13
Base Transmission (E4OD Non-Diesel Only)	Transmission Controls	Group 17

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Diagnostic Routines

216 ENGINE VIBRATES AT NORMAL SPEEDS

System	Component	Reference
Engine Accessories	Fan Belt Driven Components Engine Mounts Engine Vibration Damper	Manual and Visual
Otherwise	Non-Engine Components: Drive Line, Tires, Wheel Balance	Manual and Visual

217 ENGINE RUNS COLD

System	Component	Reference
Gauge System	Gauge, Sender	Group 33 and *Group 13
Cooling	Thermostat	Group 27 and *Group 3

218 ENGINE RUNS HOT

System	Component	Reference
Cooling	Coolant Level Radiator or A/C Condenser Pressure Cap and Overflow System External Leaks Belts and Belt Tension Fan and Fan Clutch Electric Fan (If So Equipped)	Visual Group 27 and *Group 3
Gauge System	Gauge, Sender	Group 33 and *Group 13
Cooling	Thermostat	Group 27 and *Group 3
Ignition	Timing	Section 13
Vacuum Distribution	Spark Delay Valve	Section 3
EEC	Quick Test	Section 14
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Cooling	PVS	Section 3
Basic Engine	Oil Level Internal Leak(s) Core Sand in Head/Block Water Pump	Group 21 and *Group 3
Brake	Brakes (dragging)	Group 12 and *Group 6

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Diagnostic Routines

219 EXHAUST SMOKE

NOTE: White Smoke is normal during warm-up.

System	Component	Reference
Black Smoke (rich mixture)	Choke Plate and Linkage Cold Enrichment Rod and Linkage (7200)	Section 4, Group 24 and *Group 3
	Air Cleaner Element (Restricted)	Visual
	Internal Carburetor Components: Basic: Idle, Main and Accelerator Pump Metering Systems Enrichment Systems Fuel Inlet Needle/Seat Float Fuel Pressure Regulator EFI/CFI Injectors	Visual, Section 4, Section 11 (for fuel pressure regulator diagnostics EFI/CFI), Group 24 and *Group 3
	EEC Components	Section 14
	MCU Components	Special MCU Diagnosis Manual
Blue Smoke (burning oil)	PCV Valve	Section 9
	Valve Guides/Stems/Seals Oil Drain Passages in Head	Group 21 and *Group 3
	Turbo Bearing Seals	Group 24
	Rings (not seated, seized, gummed up, worn) Cylinder bores (scuffed)	Group 21 and *Group 3
White Smoke (coolant in combustion)	Thermactor Vacuum Delay Valve (restricted) EGR Cooler Intake Manifold (cracked/porous) Cylinder Head/Gasket (leaks) Block (cracked/porous)	Section 3, Section 6, and Group 21 and *Group 3

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Diagnostic Routines

220 GAS SMELL

System	Component	Reference
Fuel Delivery	Fuel Filter (leaks) Fuel Line to Carburetor (leaks) Injectors (leaking) Fuel Pump (leaks) Fuel Line, Pump to Tank (leaks) Fuel Tank (leaks) Fuel Tank Filler Neck/Cap (leaks) Fuel Return Line (Blocked) Fuel Pressure Regulator EFI/CFI	Visual, Section 11, Group 24 and *Group 10
Internal Carburetor	Float/Inlet Needle (stuck)	Section 3, Section 4, Group 24 and *Group 3
EVAP	Carbon Canister, Solenoid, Hoses (leaks)	Section 7, Group 24, *Group 3

221 "CHECK ENGINE" LIGHT ALWAYS ON OR NEVER ON "CHECK ENGINE"/"CHECK DCL" MESSAGE ON

System	Component	Reference
NON-EEC	6.1L/7.0L Heavy Duty Truck Check Engine Light	Section 12
EEC	Quick Test	Section 14

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Diagnostic Routines

222 STATE EMISSION TEST FAILURE

NOTE: Canada and some states or metropolitan areas in the United States require periodic Idle Emission Tests. All Ford products have been designed to pass these tests. If a Ford product fails an Idle Emission Test, it is probable that 1) The engine temperature was not warm and stabilized prior to the test. 2) The vehicle had idled excessively long prior to the test.

Prior to starting any services, complaints of Idle Emission Test failure should be verified by using the test procedure of the area which failed the vehicle if the area is approved by Ford for performance warranty.

The following example encompasses most of the emissions measurement modes of the current state idle test procedures:

- Ensure that the engine is at normal operating temperature and that all accessories are turned off.
- Read emissions at idle.
- Run engine at 2500 ± 300 rpm.
- Read emissions within 30 seconds.
- Return engine speed to idle.
- Read emissions within 30 seconds.

If any emission components are changed, Keep Alive Memory (KAM) should be cleared before repeating State Emission Test procedure. Refer to Quick Test Appendix.

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Diagnostic Routines

222 STATE EMISSION TEST FAILURE (CONTINUED)

System	Component	Reference
EEC	Quick Test	Section 14
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Ignition	Scope Engine For: Spark Plug, Coil, Secondary Wires, Distributor Cap, Adapter and Rotor Timing	Section 13, Group 23 and *Group 3
Vacuum Distribution	Vacuum Leaks/Blockage	Visual and Audible
Carburetor	Idle Mixture	Section 4
External Carburetor/Fuel Charging Assy Throttle Body/Injectors	Curb or Fast Idle Speeds Electrical and Vacuum Connections Choke Plate and Linkage Cold Enrichment Rod and Linkage (7200) Venturi Valve (7200) Choke Pulldown Bowl Vent Injectors Fuel Rail	Visual, Section 4, Section 11 (for fuel pressure regulator diagnosis EFI/CFI), Group 24 and *Group 3
Internal Carburetors	Idle, Air Bleeds or Fuel Passages Float/Inlet Needle and Seat Stepper Motor (7200) Cold Enrichment System (7200)	Visual, Section 3, Section 4, Group 24 and *Group 3
EGR	Valve Vacuum Regulator	Section 6
PCV	Valve	Section 9
EVAP	Carbon Canister, Purge Solenoid	Section 3, Section 7, Group 24 and *Group 3
Thermactor	Thermactor Air Dump	Section 10
Exhaust	Pipes, Muffler, Catalyst Resonator, Heat Control Valve	Section 5
Inferred Mileage Sensor (IMS)	Module	Section 3
Cooling	Unstabilized Engine Temperature	Visual, Routine 218
Turbocharger	Turbocharger Assembly	Group 24
Basic Engine	Scheduled Maintenance Compression Valve Train Camshaft Intake Manifold Gaskets	Group 21 and *Group 3

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Diagnostic Routines

223 IMPROPER SHIFT

System	Component	Reference
Base Transmission (E4OD, A4LD, AXOD Only)	Converter Clutch Control Solenoid Converter Clutch Electronic Pressure Control Solenoid Shift Solenoid #1 Shift Solenoid #2 4 X 4 Low Switch	Group 17 and *Group 7
EEC (E4OD Only)	Quick Test	Section 14

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ENGINE/EMISSIONS DIAGNOSIS

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SECTION 3

Emission Related Components

Contents

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SECTION 3

Emission Related Components

Contents

(Continued)

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SECTION 3

Emission Related Components

Contents

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TITLE	BASIC PART NO.	SYMBOL
Air Bypass Valves	**9F715**	

DESCRIPTION

The air bypass solenoid is used to control engine idle speed and is operated by the Electronic Engine Control EEC module.

The valve allows air to pass around the throttle plates to control:

- Cold engine fast idle
- No touch start
- Dashpot
- Over temperature idle boost
- Engine idle load correction

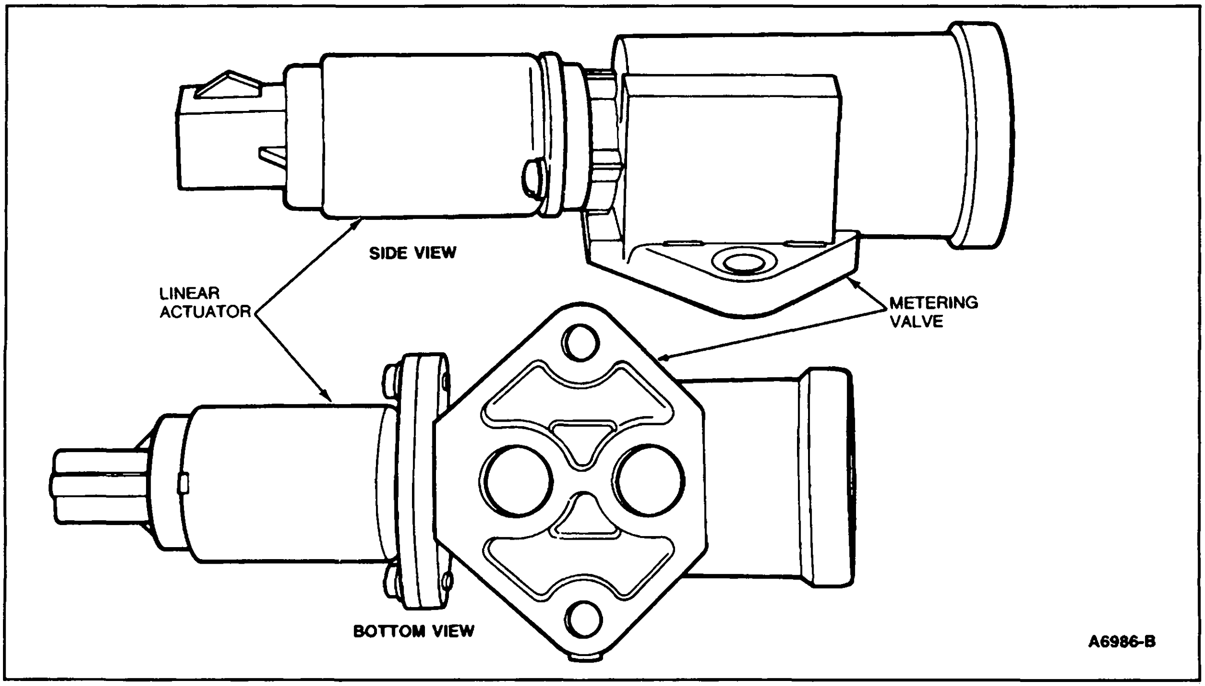

Figure 1 Air Bypass Valve Assembly — Connector May Be At An Angle

DIAGNOSIS

Refer to the EEC-IV Quick Test, Section 14.

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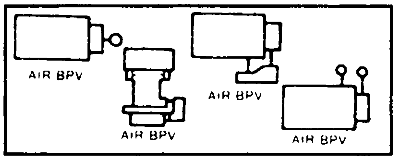
TITLE	BASIC PART NO.	SYMBOL
Air Bypass Valves	**9B289**	

DESCRIPTION

There are two general groups of Air Bypass Valves, normally closed and normally open. Each group is available in remote (in-line) versions or pump-mounted (mounted directly on the air pump) versions (Figures 1, 2 and 3). The bypass valves are part of the Thermactor System, Section 10. Normally closed valves supply air to the exhaust system with medium and high applied vacuum signals during normal (engine at normal operating temperature) modes, short idles and some accelerations. With low or no vacuum applied, the pump air is dumped through the silencer ports of the valve, or through the dump port.

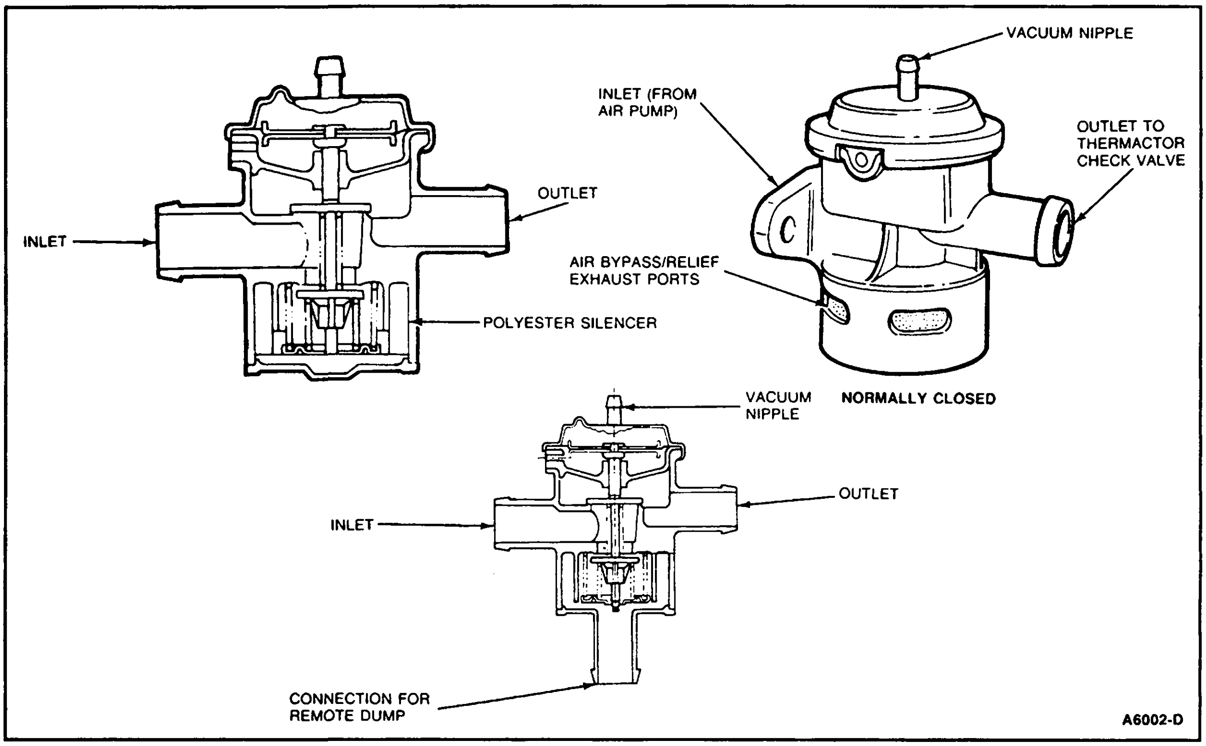


Figure 1 Normally Closed Air Bypass Valves

Normally Closed Bypass Valves (9B289)

Functional Check

1. Disconnect the air supply hose at the valve outlet.
2. Remove vacuum line to check to see that a vacuum signal is present at the vacuum nipple. Remove or bypass any restrictors or delay valves in the vacuum line. There must be a vacuum present at the nipple before proceeding.
3. With the engine at 1500 rpm and the vacuum line connected to the vacuum nipple, air pump supply air should be heard and felt at the air bypass valve outlet (Figure 1).
4. With the engine at 1500 rpm, disconnect the vacuum line. Air at the outlet should be significantly decreased or shut off. Air pump supply air should be heard or felt at the silencer ports, or at the dump port.
5. If the normally closed air bypass valve does not successfully complete the above tests, check the air pump. If the air pump is operating satisfactorily, replace the air bypass valve.

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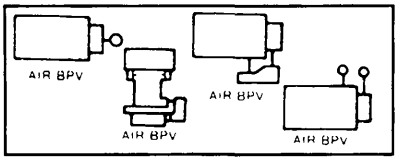
TITLE	BASIC PART NO.	SYMBOL
Air Bypass Valves	**9B289**	

Normally Open Air Bypass Valves (9B289)

Normally open air bypass valves are available with or without vacuum vents. Test procedures differ for each.

Normally open valves with a vacuum vent provide a timed air dump during decelerations and also dump when a vacuum pressure difference is maintained between the signal port and the vent port. The signal port must have 10 kPa (3 in-Hg) more vacuum than the vent port to hold the dump. This mode is used to protect the catalyst from overheating.

Normally Open Air Bypass Valves with Vacuum Vents

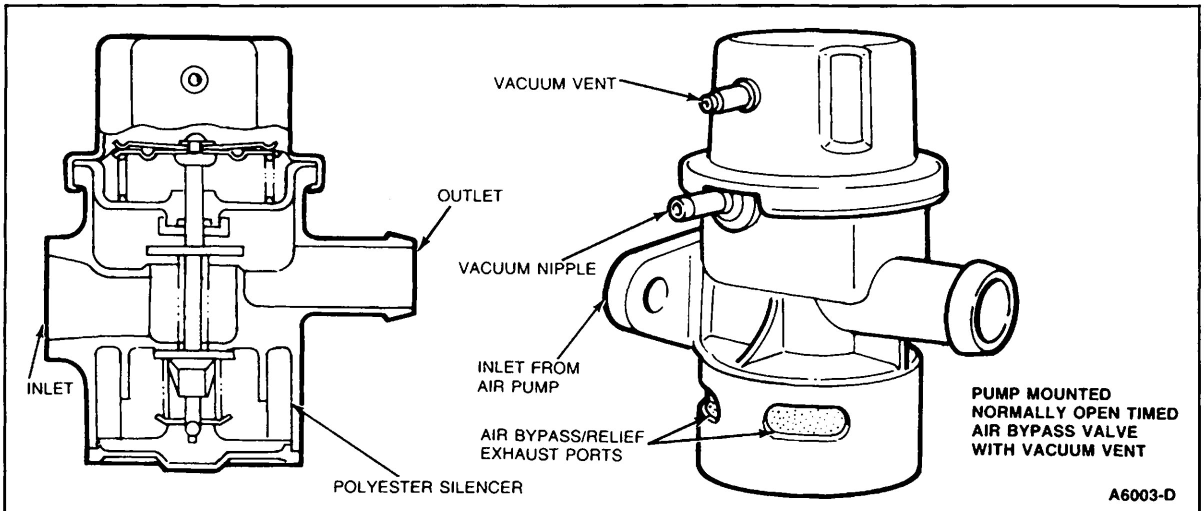


Figure 2 Normally Open Air Bypass Valves with Vacuum Vents

Functional Check

1. Disconnect the air pump supply line at the outlet.
2. Disconnect all vacuum lines from the vacuum nipple and the vacuum vent (Figure 2).
3. With the engine at 1500 rpm, air pump supply air should be heard and felt at the outlet (Figure 2).
4. Using a length of vacuum hose with no restrictors or devices, connect the vacuum nipple to one of the manifold vacuum fittings on the intake manifold. With the vacuum vent open to atmosphere and the engine at 1500 rpm, virtually no air should be felt at the valve outlet and virtually all air should be bypassed through the silencer ports.
5. Using the same direct vacuum line to an intake manifold vacuum source, cap the vacuum vent. Accelerate the engine to 2000 rpm, and suddenly release the throttle. A momentary interruption of air pump supply air should be felt at the valve outlet (Figure 2).
6. Reconnect all vacuum and thermactor lines. If any of the above tests are not satisfactorily completed, check the air pump. If the air pump is operating satisfactorily, replace the air bypass valve.

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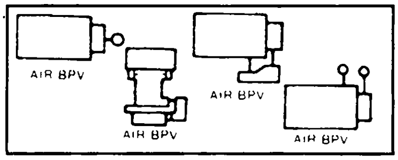
TITLE	BASIC PART NO.	SYMBOL
Air Bypass Valves	**9B289**	

Normally Open Air Bypass Valves without Vacuum Vent

Normally open valves without a vacuum vent provide a timed dump of air for 1.1 or 2.8 seconds when a sudden high vacuum of about 68 kPa (20 in-Hg) is applied to the signal port. This prevents backfire during deceleration.

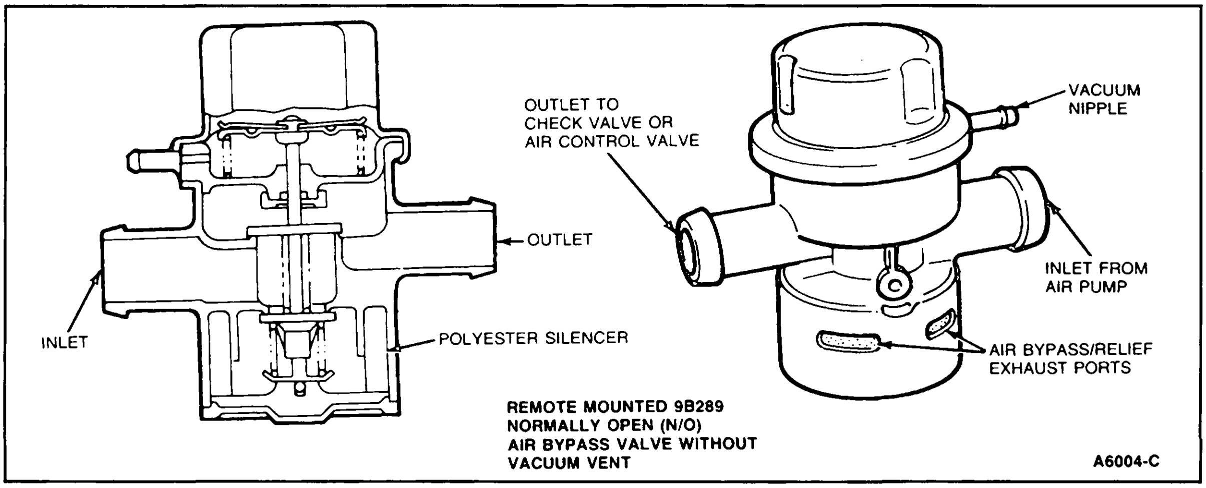


Figure 3 Normally Open Air Bypass Valves Without Vacuum Vent (9B289)

Functional Check

1. Disconnect the air supply line at the valve outlet (Figure 3).
2. Disconnect the vacuum line at the vacuum nipple.
3. With the engine at 1500 rpm, air should be heard and felt at the valve outlet.
4. Connect a direct vacuum line that is free from restrictions from any manifold vacuum source to the vacuum nipple on the air bypass valve. Air at the outlet should be momentarily decreased or shut off.
5. Air pump supply air should be heard or felt at silencer ports (Figure 3) during the momentary dump. Restore all original connections. If any of the above tests are not satisfactorily completed, check the air pump. If the air pump is operating satisfactorily, replace the air bypass valve.

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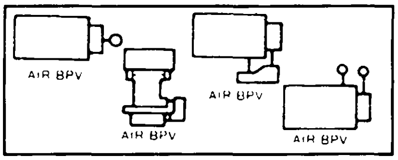
TITLE	BASIC PART NO.	SYMBOL
Air Bypass Valves	**9B289**	

Normally Open Air Bypass Valves without Vacuum Vent

Heavy Truck Applications

Normally open valves without a vacuum vent provide a timed dump of air for two seconds nominal when a sudden high vacuum of about 68 kPa (20 in-Hg) is applied to the signal port. This prevents backfire during deceleration.

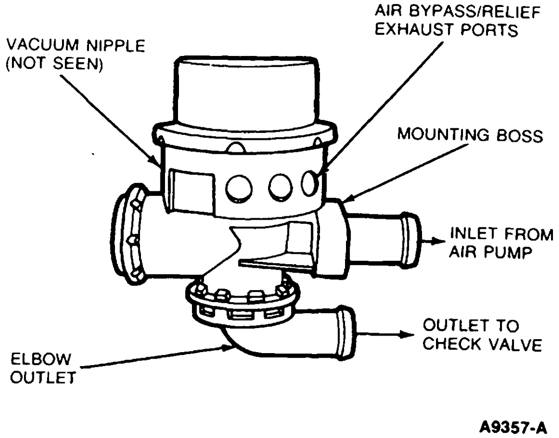


Figure 4 Normally Open Without Vacuum Vent

Functional Check

1. Disconnect the air supply line at the valve outlet (Figure 4).
2. Disconnect the vacuum line at the vacuum nipple.
3. With the engine at 1500 rpm, air should be heard and felt at the valve outlet.
4. Connect a direct vacuum line that is free from restrictions from any manifold vacuum source to the vacuum nipple on the air bypass valve. Air at the outlet should be momentarily decreased or shut off.
5. Air pump supply air should be heard or felt at silencer ports (Figure 4) during the momentary dump. Restore all original connections. If any of the above tests are not satisfactorily completed, check the air pump. If the air pump is operating satisfactorily, replace the air bypass valve.

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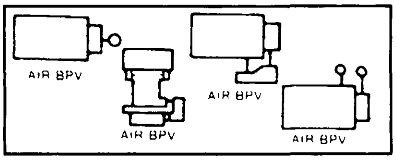
TITLE	BASIC PART NO.	SYMBOL
Air Bypass Valves	**9B289**	

Normally Open Air Bypass Valves (9B289)

Heavy Truck Applications

Normally open valves with a vacuum vent provide a timed air dump deceleration and also dump when a vacuum pressure difference is maintained between the signal port and the vent port. The signal port must have 10 kPa (3 in-Hg) more vacuum than the vent port to hold the dump. This mode is used to protect the catalyst from overheating.

Normally Open Air Bypass Valves with Vacuum Vents

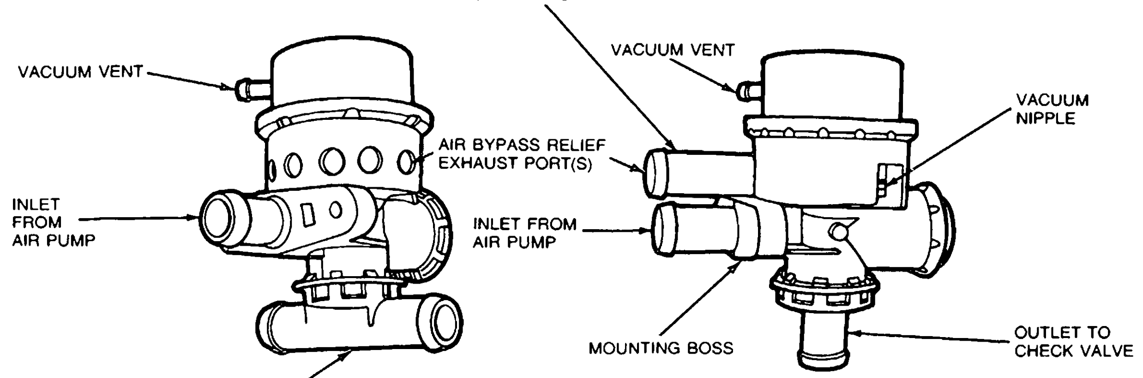


Figure 5 Normally Open Air Bypass Valves

Functional Check

1. Disconnect the air supply line at the valve outlet (Figure 5) and relief port if applicable.
2. Disconnect the vacuum line at the vacuum nipple.
3. With the engine at 1500 rpm, air should be heard and felt at the valve outlet.
4. Connect a direct vacuum line that is free from restrictions from any manifold vacuum source to the vacuum nipple on the air bypass valve. Air at the outlet should be momentarily decreased or shut off.
5. Air pump supply air should be heard or felt at silencer ports (Figure 5) during the momentary dump. Restore all original connections. If any of the above tests are not satisfactorily completed, check the air pump. If the air pump is operating satisfactorily, replace the air bypass valve.

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TITLE	BASIC PART NO.	SYMBOL
Air Charge Temperature Sensor	**12A697**	

DESCRIPTION

The sensor provides the Electronic Fuel Injection System with mixture (fuel and air) temperature information. The ACT is used both as a density corrector for airflow calculation and to proportion the cold enrichment fuel flow. This sensor is similar in construction to the Engine Coolant Temperature (ECT) sensor, except it is packaged to improve sensor response time.

The sensor is threaded into a cylinder runner of the intake manifold and provides the fuel strategy with mixture temperature information. The sensor input is used as a density corrector for airflow calculations and to proportion the cold enrichment fuel flow.

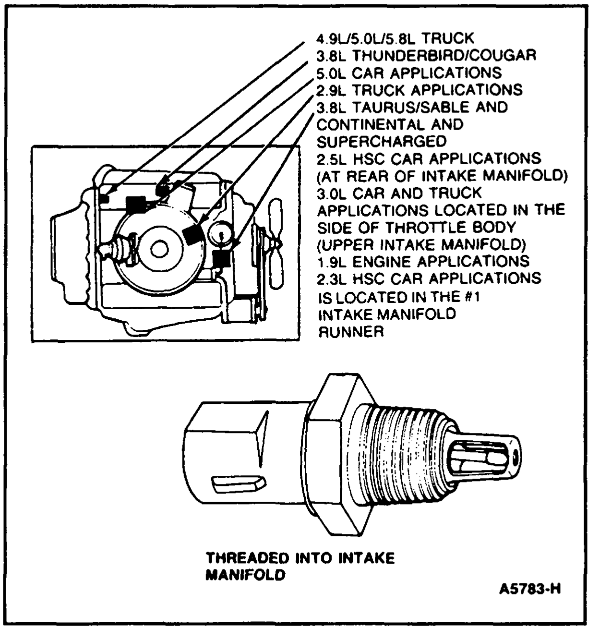

Figure 1 ACT (Air Charge Temperature) Sensor

DIAGNOSIS

Refer to the EEC-IV Quick Test, Section 14.

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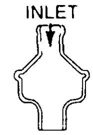
TITLE	BASIC PART NO.	SYMBOL
Air Check Valve/ Pulse Air Valve	**9A487**	

DESCRIPTION

The Air Check Valve (Figure 1) is a one-way valve that allows thermactor air to pass into the exhaust system while preventing exhaust gases from passing in the opposite direction.

The Pulse Air Valve (Figure 2) replaces the air pump application in some thermactor systems. It permits air to be drawn into the exhaust system on vacuum exhaust pulses and blocks the backflow of high-pressure exhaust pulses. The fresh air completes the oxidation of exhaust gas components.

NOTE: Although the two valves share the same basic part number and have the same appearance, they are NOT INTERCHANGEABLE.

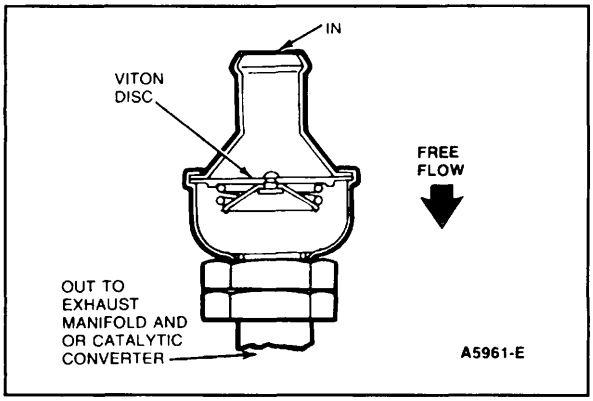


Figure 1 Air Check Valve

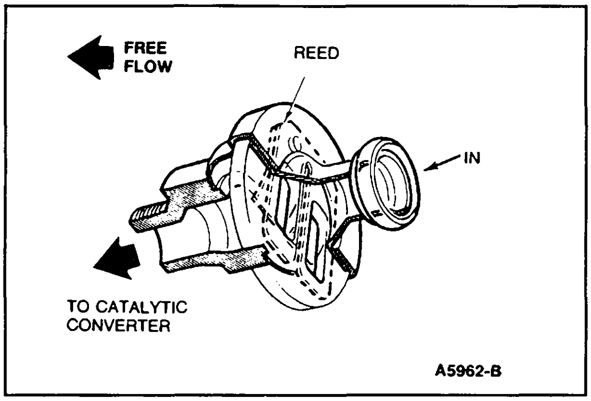


Figure 2 Pulse Air Valve (Thermactor II)

Functional Check

- Visually inspect the thermactor system hoses, tubes, control valve(s) and check valve(s) for leaks that may be due to backflow of exhaust gas. If holes are found and/or traces of exhaust gas products are evident, the check valve may be suspect.
- As shown in the above illustrations, the valves should allow free flow of air in the direction of the arrow only. The valve(s) should check (or block) the free flow of exhaust gas in the opposite direction.
- Replace the valve if air does not flow as indicated or if exhaust gas backflows opposite of the direction of the arrow.

NOTE: Refer to Section 10 for a description of the Thermactor System.

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TITLE	BASIC PART NO.	SYMBOL
Air Cleaner Cold Weather Modulator	**9E862**	A/CL CWM

DESCRIPTION

A cold weather modulator is sometimes used in addition to the air cleaner temperature control (bimetal) sensor to control the inlet air temperature.

The cold weather modulator traps vacuum in the system, so the door will not switch to cold air when the vacuum drops during acceleration. The cold weather modulator only works when the outside air is cold, (refer to the chart below).

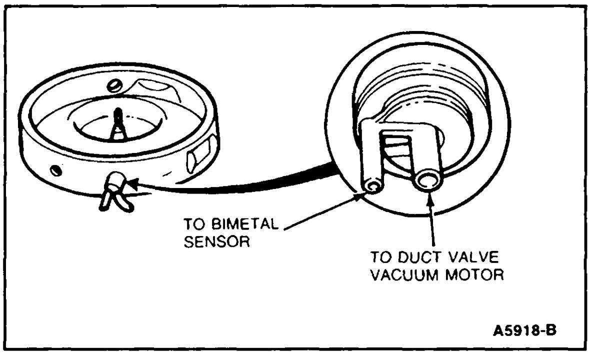

Figure 1 Cold Weather Modulator

DIAGNOSIS

A 54 kPa (16 in-Hg) vacuum applied to motor side of the modulator holds or leaks as follows:

COLOR	TYPE	HOLDS	LEAKS
Black	N/O	Below -6.7°C (20°F)	Above 1.7°C (35°F)
Blue	N/O	Below 4.4°C (40°F)	Above 12.8°C (55°F)
Green	N/O	Below 10°C (50°F)	Above 24.4°C (76°F)
Yellow	N/C	Above 18.3°C (65°F)	Below 10°C (50°F)

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TITLE	BASIC PART NO.	SYMBOL
Air Cleaner Temperature Sensor	**9E607**	O A/CL BIMET

DESCRIPTION

The sensor is installed in the cleaner tray or air cleaner line and is subject to temperature changes within the air cleaner. At a given increase in temperature, the sensor bleeds off vacuum, permitting the vacuum motor to open the duct door to allow fresh air in while shutting off full heat.

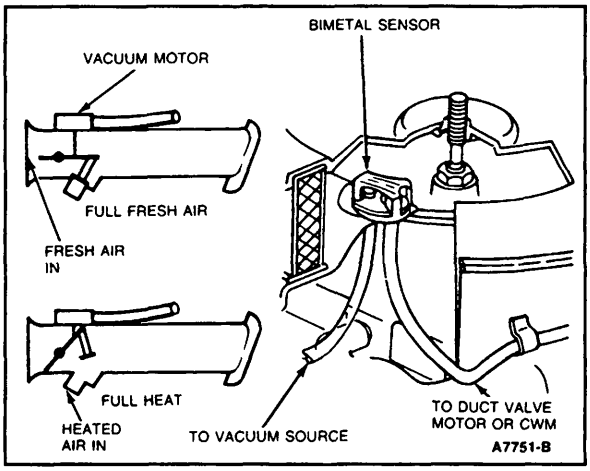

Figure 1 Air Cleaner Temperature Sensor

DIAGNOSIS

At an ambient temperature of less than 24°C (75°F), the sensor will allow vacuum to close the duct door to fresh air. The sensor will bleed off vacuum to allow the duct door to open and let in fresh air at or above the following temperatures:

Brown	24°C (75°F)
Pink, black, or red	32.2°C (90°F)
Blue, yellow or green	40.6°C (105°F)

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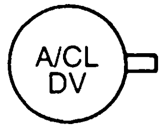
TITLE	BASIC PART NO.	SYMBOL
Air Cleaner Vacuum Motor	**9D604**	

DESCRIPTION

The air cleaner vacuum motor operates the door within the duct, which allows either warm or cold air to enter the engine, depending upon the temperature within the air cleaner.

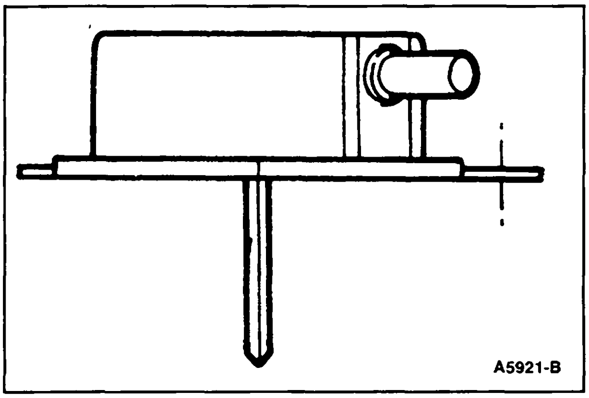


Figure 1 Air Cleaner Vacuum Motor

DIAGNOSIS

When a vacuum of 27 kPa (8 in-Hg) or greater is applied to the vacuum motor, the door stem should pull up and stay as long as vacuum is applied to the vacuum motor.

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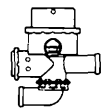
TITLE	BASIC PART NO.	SYMBOL
Air Control Valve (Switch-Relief)	**9F491**	

DESCRIPTION

The Air Supply Control Valve is used in the Thermactor (secondary air) System.

The air control valve directs air pump output to the exhaust manifold or downstream to the catalyst system depending upon the engine control strategy. The air control valve may be used as a Thermactor bypass valve (Figure 2), directing air to the catalyst/exhaust system or to a remote air dump location depending on engine control strategy. A pressure relief valve also provides air pump protection in the event of excessive exhaust back pressure or system blockage.

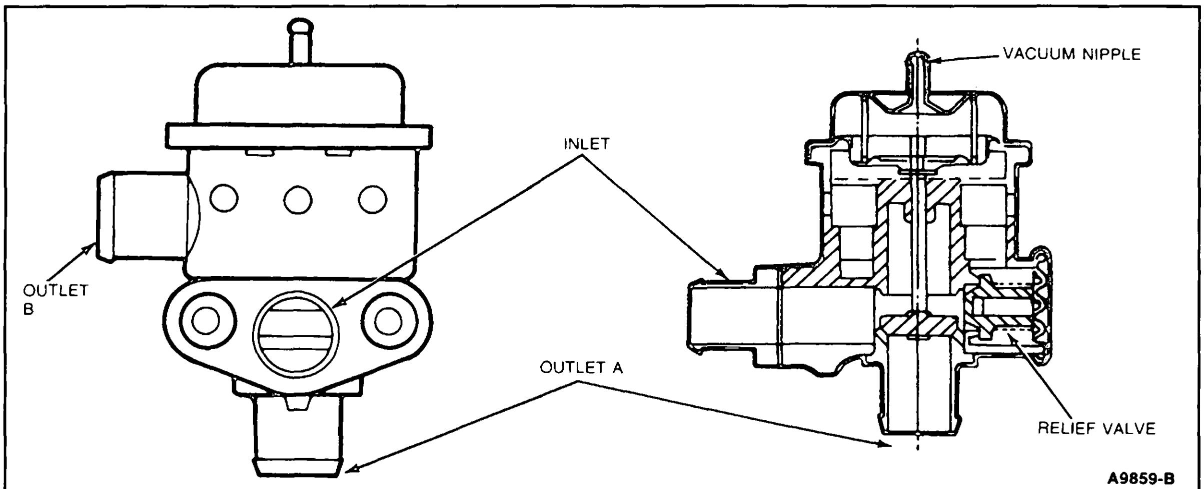


Figure 1 Air Control Valve (Switch-Relief)

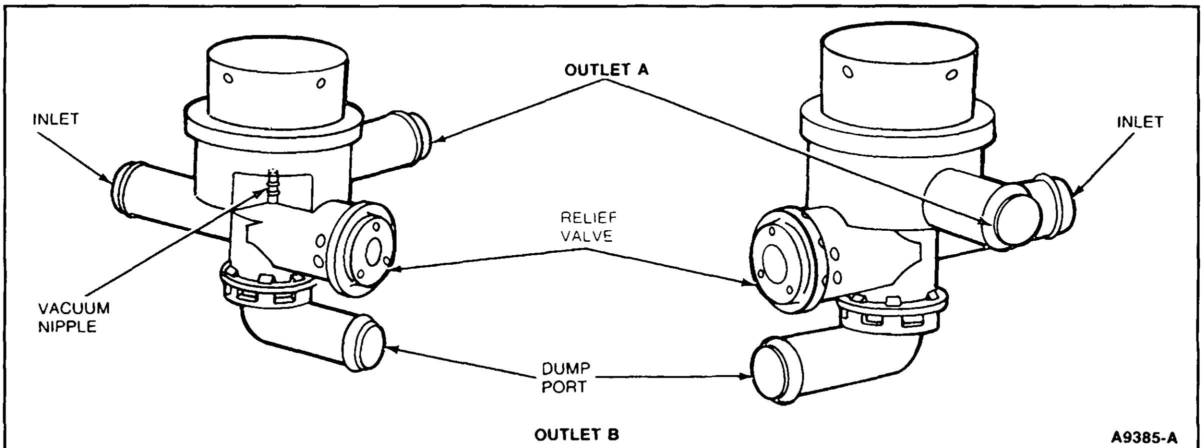


Figure 2 Air Control Valve (Thermactor Bypass Type)

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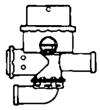
TITLE	BASIC PART NO.	SYMBOL
Air Control Valve (Switch-Relief)	**9F491**	

Functional Check

1. Verify that airflow is being supplied to the valve inlet by disconnecting the air supply hose at the inlet and verifying the presence of airflow with the engine at 1500 rpm. Reconnect the air supply hose to the valve inlet.
2. Disconnect the air supply hoses at outlets A and B (Figure 1 or Figure 2).
3. Remove the vacuum line at the vacuum nipple.
4. Accelerate the engine to 1500 rpm. Airflow should be heard and felt at outlet B with little or no airflow at outlet A (Figure 1 or Figure 2).
5. With the engine at 1500 rpm, connect a direct vacuum line from any manifold vacuum fitting to the air control valve vacuum nipple. Airflow should be heard and felt at outlet A with little or no airflow at Outlet B.
6. Restore all connections. If conditions above are not met, replace the air control valve.

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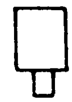
TITLE	BASIC PART NO.	SYMBOL
Air Silencer	**9G427** **9H467**	 SILN

DESCRIPTION

The Air Silencer is a combination silencer and filter for air supply pumps that are not equipped with an impeller-type centrifugal air filter fan or for pulse air (Thermactor II) systems. The air silencer is mounted in a convenient position in the engine compartment and is connected to the air supply pump or pulse air valve inlet by means of a flexible hose.

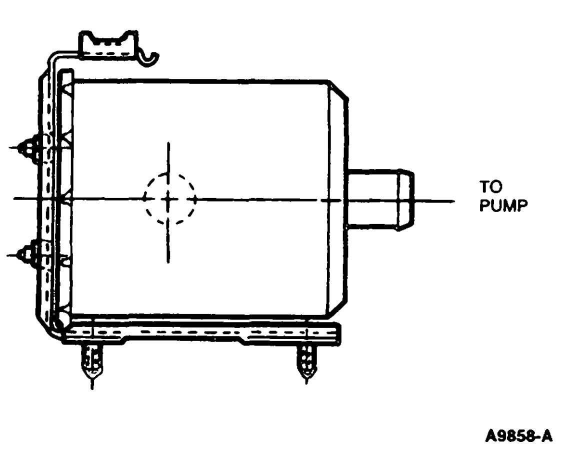


Figure 1 Air Silencer - 9H467, Typical

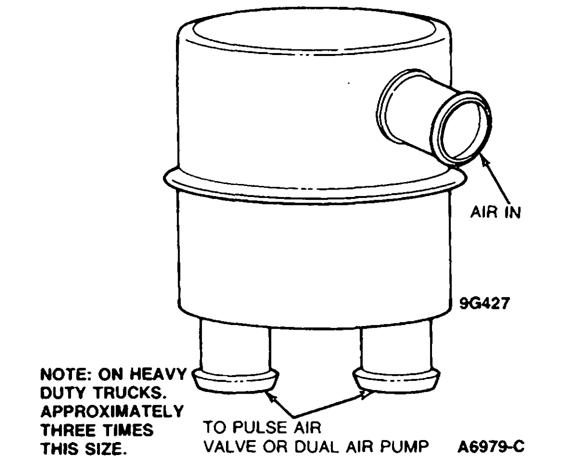


Figure 2 Air Silencer - 9G427, Typical

Functional Check

1. Inspect hoses and air silencer for leaks.
2. Disconnect hose from air silencer outlet, remove silencer and visually inspect for plugging.
3. The air silencer is operating satisfactorily if no plugging or leaks are encountered.

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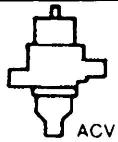
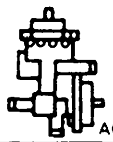
TITLE	BASIC PART NO.	SYMBOL
Air Supply Control Valve	**9F491**	 

DESCRIPTION

The Air Supply Control Valve is used in the Thermactor (secondary air) System.

The air control valve directs air pump output to the exhaust manifold or downstream to the catalyst system depending upon the engine control strategy.

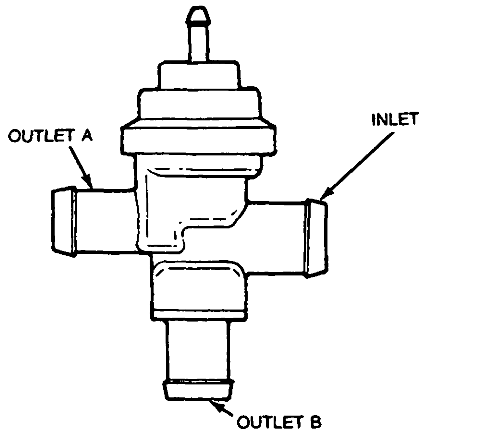


Figure 1 Standard Air Control Valve

Functional Check

1. Verify that airflow is being supplied to the valve inlet by disconnecting the air supply hose at the inlet and verifying the presence of airflow with the engine at 1500 rpm. Reconnect the air supply hose to the valve inlet.
2. Disconnect the air supply hose at outlets A and B (Figure 1).
3. Remove the vacuum line at the vacuum nipple.
4. Accelerate the engine to 1500 rpm. Airflow should be heard and felt at outlet B with little or no airflow at outlet A (Figure 1).
5. With the engine at 1500 rpm, connect a direct vacuum line from any manifold vacuum fitting to the air control valve vacuum nipple. Airflow should be heard and felt at outlet A with little or no airflow at outlet B.
6. If the valve is the bleed type, less air will flow from outlet A or B, and the main discharge will change when vacuum is applied to the vacuum nipple.
7. Restore all connections. If conditions above are not met, replace the air control valve.

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TITLE	BASIC PART NO.	SYMBOL
Air Supply Pump	**9A486**	

DESCRIPTION

Passenger Cars and Light Trucks

The Air Supply Pump is a belt-driven, positive displacement, vane-type pump that provides air for the Thermactor system. It is available in 11-cubic inch and 19-cubic inch sizes, either of which may be driven with different pulley ratios for different applications. The 11-cubic inch pump (Figure 1) receives its air through a remote filter attached to the air inlet nipple, through a hose connected to the clean air side of the air cleaner or through an impeller-type centrifugal air filter fan. The 19-cubic inch pump (Figure 2) uses an impeller-type centrifugal air filter fan which separates dirt, dust, and other contaminants from the intake air by centrifugal force. The air supply pump does not have a pressure relief valve, a function performed by the bypass valve. A description of the Thermactor System is in Section 10.

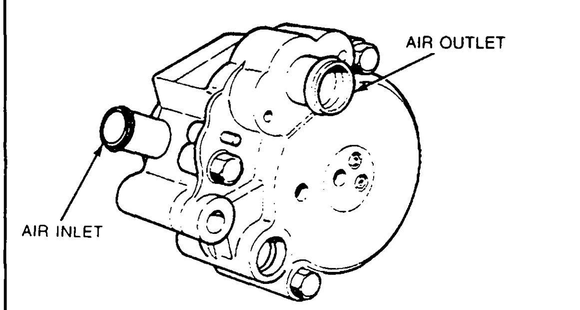

Figure 1 11-Cubic Inch Thermactor Air Supply Pump

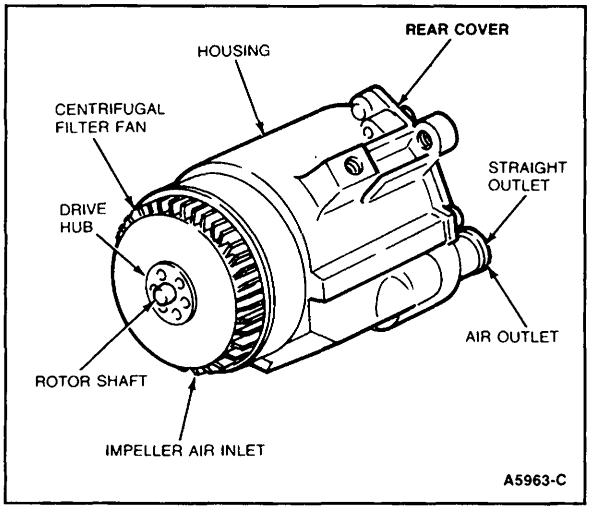

Figure 2 19-Cubic Inch Thermactor Air Supply Pump

Functional Check

1. Check belt tension and adjust to specification.
2. Disconnect air supply hose from bypass control valve.
3. The pump is operating satisfactorily if airflow is felt at the pump outlet and the flow increases as the engine speed is increased.

Do not pry on the pump to adjust belt. The aluminum housing is likely to collapse.

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TITLE	BASIC PART NO.	SYMBOL
Air Supply Pump	**9A486**	

DESCRIPTION

Heavy Duty Trucks

The Air Supply Pump is a belt-driven, positive displacement, vane-type pump that provides air for the Thermactor system. It is available in 19 and 22 cubic inch sizes, either of which may be driven with different pulley ratios for different applications. Both pumps (Figure 3), receive air from a remote silencer filter attached to the pumps' air inlet nipple. The pressure relief function is performed by the bypass valve. A description of the Thermactor System is in Section 10.

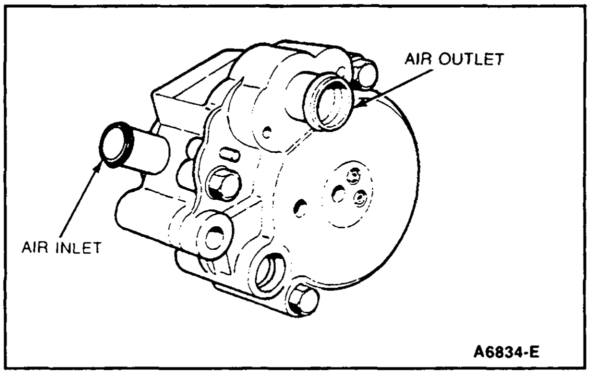

Figure 3 19 and 22 Cubic Inch Thermactor Air Supply Pump

Functional Check

1. Check belt tension and adjust to specification.
2. Disconnect air supply hose from bypass control valve.
3. The pump is operating satisfactorily if airflow is felt at the pump outlet and the flow increases as the engine speed is increased.

Do not pry on the pump to adjust belt. The aluminum housing is likely to collapse.

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TITLE	BASIC PART NO.	SYMBOL
Air Throttle Body Assembly	**9E926**	

DESCRIPTION

The Throttle Body Assembly (Figure 1) controls airflow to the engine through a single or dual butterfly valve. The throttle position is controlled by conventional linkage. The body is a single-piece, die casting of aluminum. It has a single bore with an air bypass channel around the throttle plate.

Other features of the air throttle body assembly include:

1. An adjustment screw to set the throttle plate at a minimum idle airflow position
2. A pre-set stop to locate the wide-open throttle (WOT) position
3. A throttle body mounted throttle position sensor
4. A PCV fresh air source upstream of the throttle plate (some applications)
5. Individual vacuum taps for PCV and EGR control signals (some applications)
6. Idle air bypass valve (some applications)

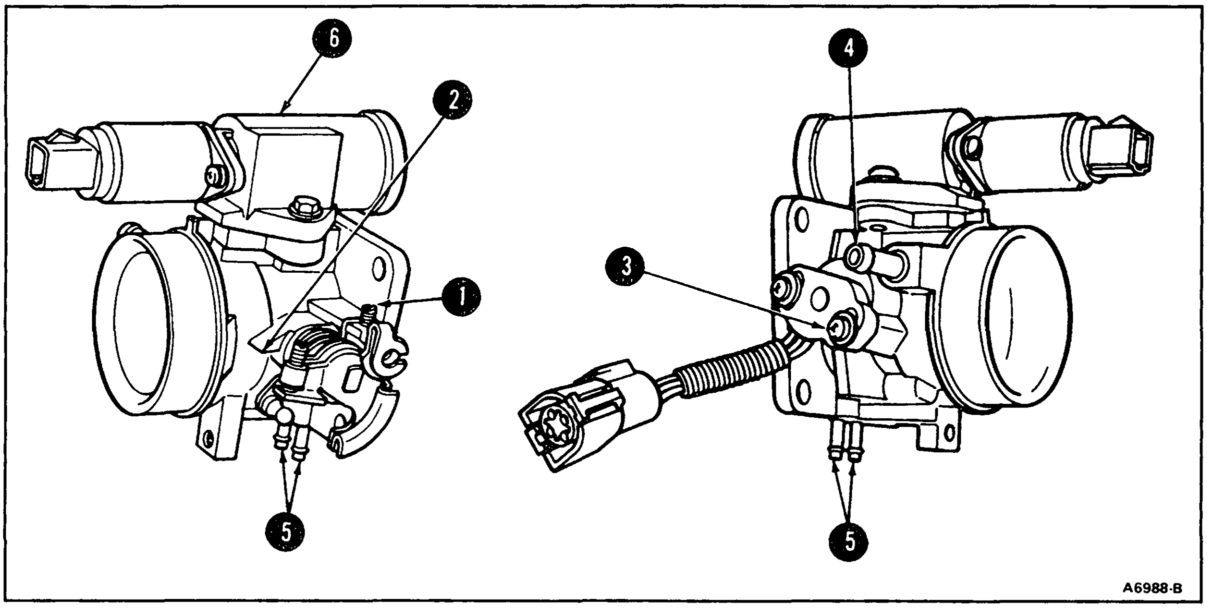

Figure 1 Typical Air Throttle Body Assembly

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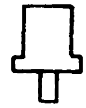
TITLE	BASIC PART NO.	SYMBOL
Barometric Absolute Pressure Sensor	**9F479**	

DESCRIPTION

The BAP sensor measures barometric pressure using a frequency. This gives the ECA information on engine load.

It is used as a barometric sensor for altitude compensation, updating the ECA during Key On Engine Off and every wide-open throttle.

The ECA uses BAP for:

- Spark advance
- EGR flow
- Air/fuel ratio

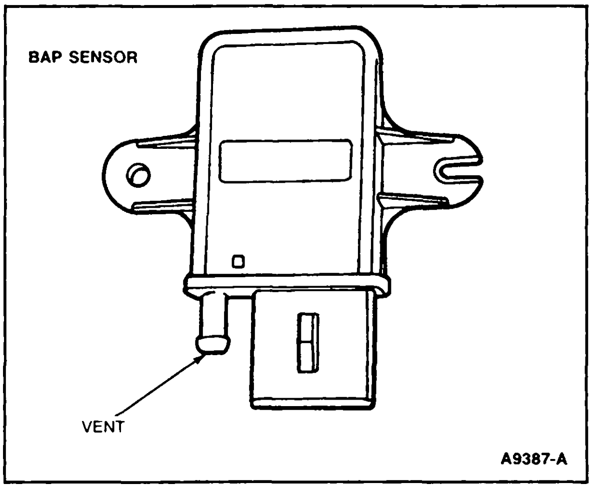


Figure 1 Barometric Absolute Pressure Sensor

DIAGNOSIS

Refer to the EEC-IV Quick Test, Section 14.

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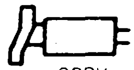
TITLE	BASIC PART NO.	SYMBOL
Canister Purge Regulator Valve	**9C915**	 CPRV

DESCRIPTION

The canister purge solenoid is part of the Evaporative Emission Control System (Section 7) and is used with the Electronic Engine Control (EEC).

This valve controls the flow of vapors from the carbon canister to the intake manifold during various engine operating modes. This valve controls carbon canister purging.

This is a normally closed valve that is opened by a signal from the electronic control assembly (ECA).

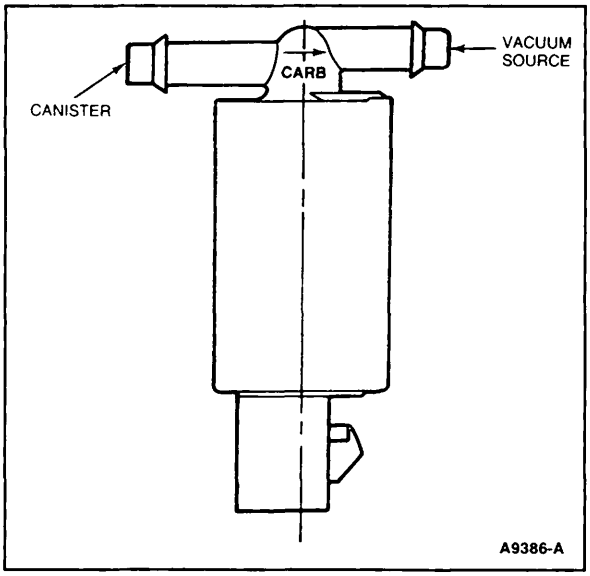


Figure 1 Canister Purge Regulator Valve

DIAGNOSIS

With valve de-energized, apply 5 in-Hg to "vacuum source" port, valve should not pass air; if it does, replace valve.

While applying 9-14 volts DC to valve, the valve will open and pass air. If it does not, replace valve.

NOTE: The Evaporative Emission System is outlined in Section 7.

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TITLE	BASIC PART NO.	SYMBOL
Canister Purge Valve	**9B963**	

DESCRIPTION

The Canister Purge Valve is part of the Evaporative Emission Control System, Section 7.

The valve (Figure 1) is in-line with the carbon canister and controls the flow of vapors from the canister to the engine.

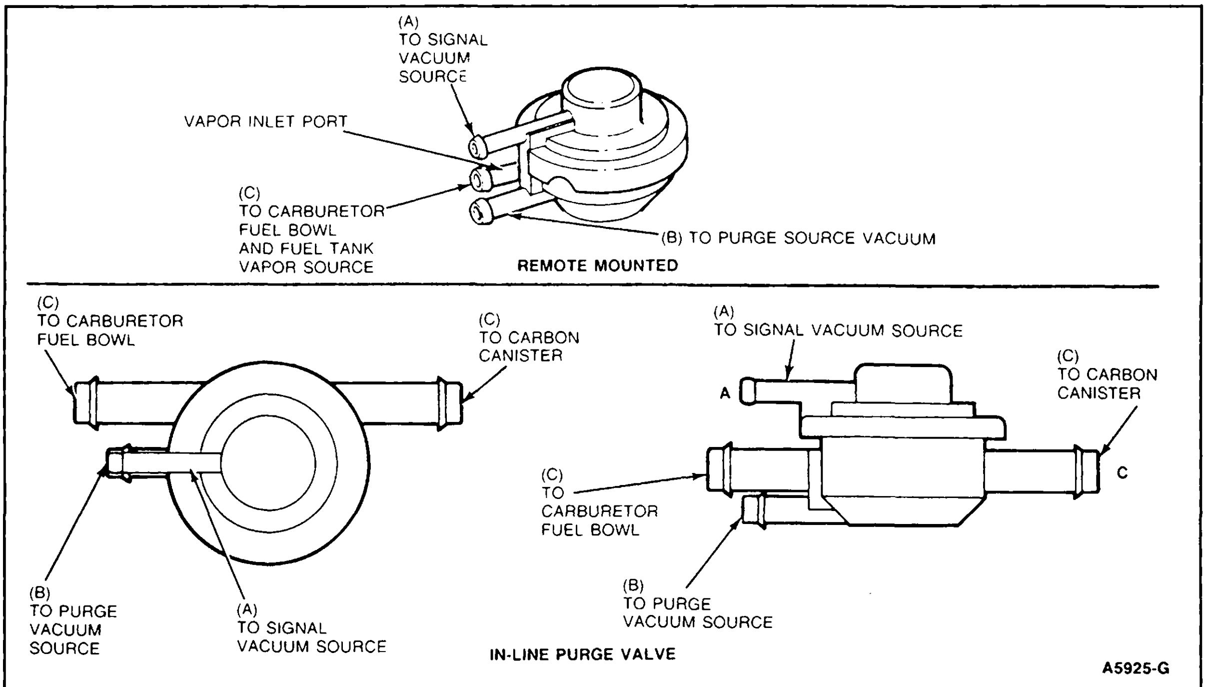

Figure 1 Purge Control Valve

DIAGNOSIS

Application of vacuum to Port A (only) should indicate no flow. If flow occurs, replace valve.

Application of vacuum to Port B (only) should indicate no flow, valve should be closed (all valves except E5VE-AA, E4VE-AA, E77E-AA, which should indicate slight flow). If valve flows (except E5VE-AA, E4VE-AA, E77E-AA), replace valve.

After applying and maintaining 54 kPa (16 in-Hg) vacuum to Port A, apply vacuum to Port B. Air should pass. (Note: Valves E5VE-AA, E4VE-AA, E77E-AA should indicate higher flow than that indicated in above test.)

Important: Never apply vacuum to Port(s) C. Doing so may dislodge internal diaphragm and valve will be permanently damaged.

NOTE: The Evaporative Emission System is outlined in Section 7.

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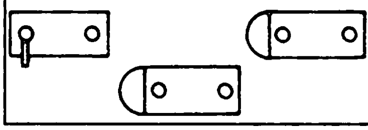
TITLE	BASIC PART NO.	SYMBOL
Carbon Canister	**9D653**	

DESCRIPTION

The fuel vapors from the fuel tank and carburetor fuel bowl are stored in the carbon canister until the vehicle is operated, at which time, the vapors will purge from the canister into the engine for consumption. There are two canister sizes, 925 ml and 1400 ml carbon. Canisters are sometimes used in pairs when the vehicle has a large fuel tank, or dual fuel tanks or dual carburetor bowls.

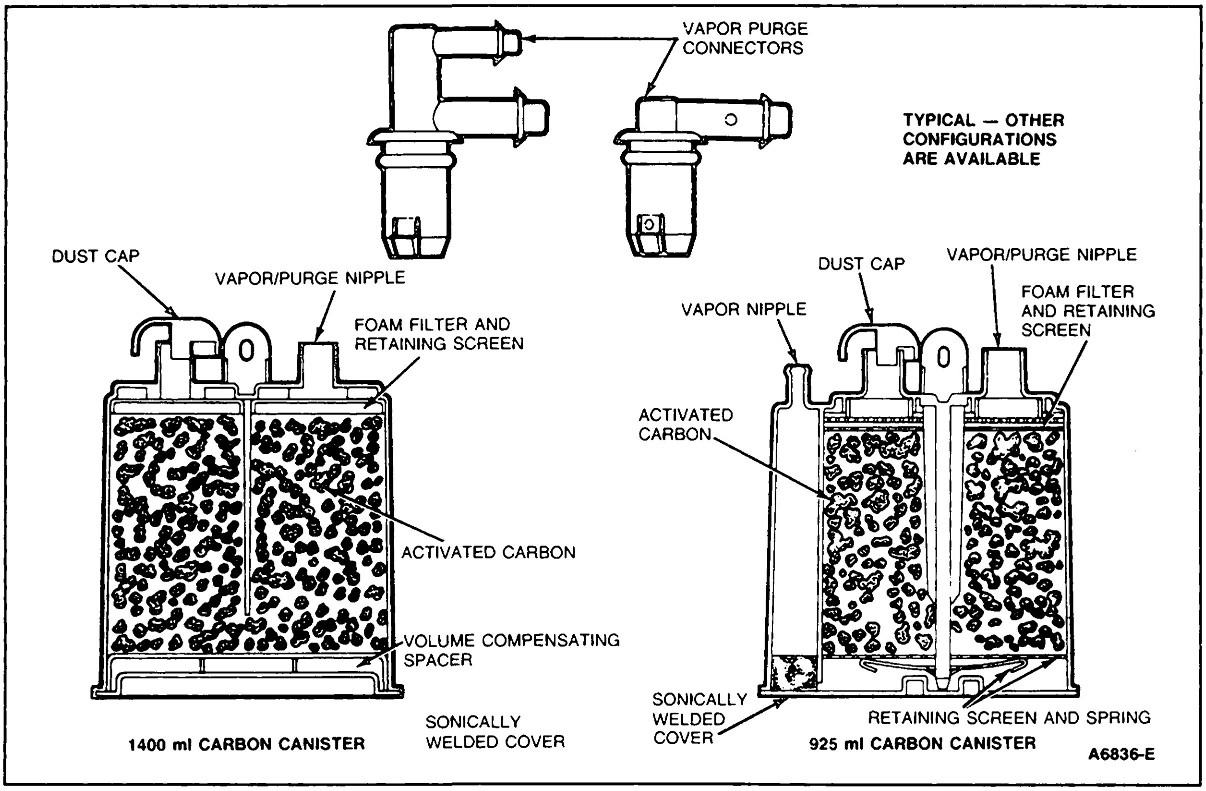


Figure 1 Carbon Canisters

DIAGNOSIS

There are no moving parts and nothing to wear in the canister.

Check for loose, missing, cracked, or broken connections and parts.

There should be no liquid in the canister.

NOTE: The Evaporative Emission System is outlined in Section 7.

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TITLE	BASIC PART NO.	SYMBOL
Carburetor Fuel Bowl Solenoid Vent Valve	**9B982**	SV-CBV

DESCRIPTION

The Fuel Bowl Vent Solenoid Valve (Figure 1) is part of the Evaporative Emission Control System (Section 7) and is a normally open valve located in the fuel bowl vent line. The vent solenoid valve closes off the fuel bowl vent line when the engine is running, and it returns to the normally open condition when the ignition switch is turned off.

NOTE: If lean fuel mixture is suspected as the cause of a problem, inspect the bowl vent solenoid valve for proper closing during engine operation. If the valve leaks or does not close, the carburetor will give an incorrect air/fuel mixture.

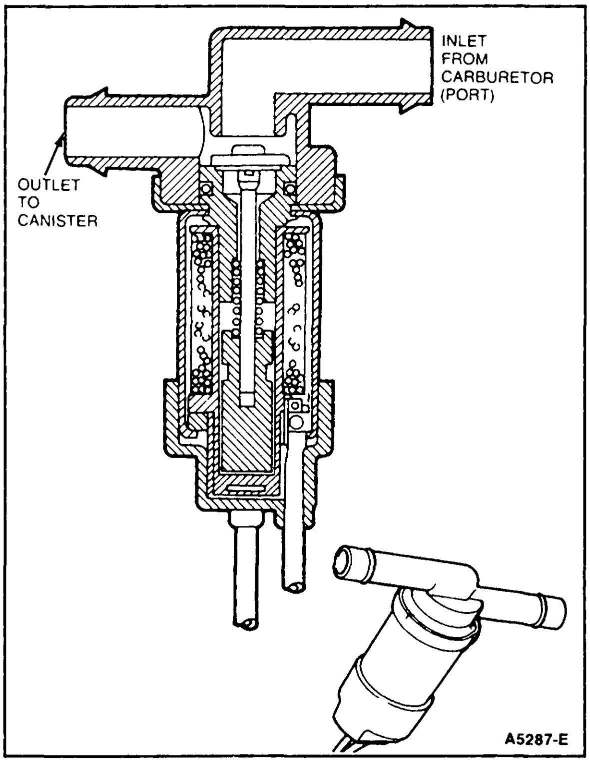

Figure 1 Fuel Bowl Vent Solenoid Valve

DIAGNOSIS

Apply 9-14 volts DC to valve. The valve should close, not allowing air to pass. If valve does not close or leaks when voltage and 1 in-Hg vacuum is applied to carburetor port, replace the valve.

NOTE: The Evaporative Emission System is outlined in Section 7.

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TITLE	BASIC PART NO.	SYMBOL
Carburetor Fuel Bowl Thermal Vent Valve	**9E589**	 TVV

DESCRIPTION

The Thermal Vent Valve (Figure 1) is a temperature actuated closed-to-flow/open-to-flow valve. It is inserted in the carburetor-to-canister vent line and is closed when the engine compartment is cold. This prevents fuel tank vapors (generated when the fuel tank heats up before the engine compartment does) from being vented through the carburetor fuel bowl — forcing them instead into the carbon canister.

This effect can occur, for instance, when sunlight strikes a vehicle which has been sitting out all night, and begins to warm the fuel tank. With the thermal vent valve closed, the vapors cannot enter the carburetor fuel bowl vent valve (now closed) but must be routed to the carbon canister. As the engine compartment warms up, during normal engine operation, the thermal vent valve opens. When the engine is again turned off, the thermal vent valve (now open because underhood temperature is above 120°F) allows fuel vapors generated from the carburetor float bowl to pass through the valve and store themselves in the carbon canister. As the thermal vent valve cools, it again closes and the cycle begins again.

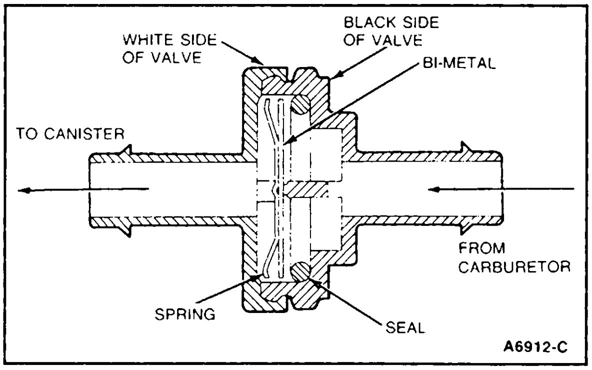

Figure 1 Fuel Bowl Thermal Vent Valve

DIAGNOSIS

At 90°F and below, the vent valve is fully closed and at 120°F and above, the vent valve is fully open. At temperatures between 90°F and 120°F, the valve may be either open or closed.

NOTE: The Evaporative Emission System is outlined in Section 7.

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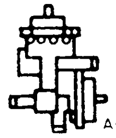
TITLE	BASIC PART NO.	SYMBOL
Combination Air Bypass/Air Control Valve	**9F491**	

DESCRIPTION

The Combination Air Bypass/Air Control Valve (9F491) combines the functions of the air bypass valve (9B289) and the air control valve (9F491) into a single unit. There are two normally closed valves; the non-bleed type (Figure 1) and the bleed type (Figure 2) all of which look alike. One distinguishing feature will be that the bleed type will have the percent of bleed molded into the plastic case.

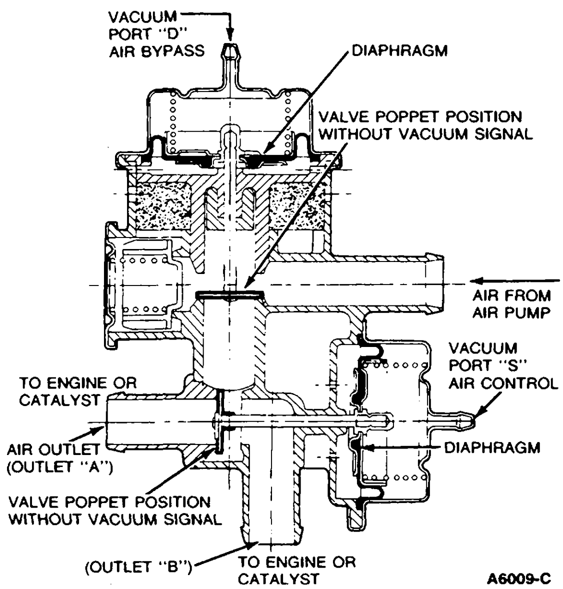


Figure 1 Valve Assembly — Exhaust Air Supply Control (Normally Closed) Without Bleed

Functional Check

Normally Closed, Figures 1 and 2.

1. Disconnect hoses from outlets A and B.
2. Disconnect and plug vacuum line to port D.
3. With engine operating at 1500 rpm, airflow should be noted coming out of the bypass vents.
4. Reconnect vacuum line to port D, and disconnect and plug vacuum line to port S. Ensure vacuum is present in the line to vacuum port D.
5. With engine operating at 1500 rpm, airflow should be noted coming out of outlet B (no airflow should be detected at outlet A).

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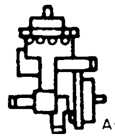
TITLE	BASIC PART NO.	SYMBOL
Combination Air Bypass/Air Control Valve	**9F491**	 ACV

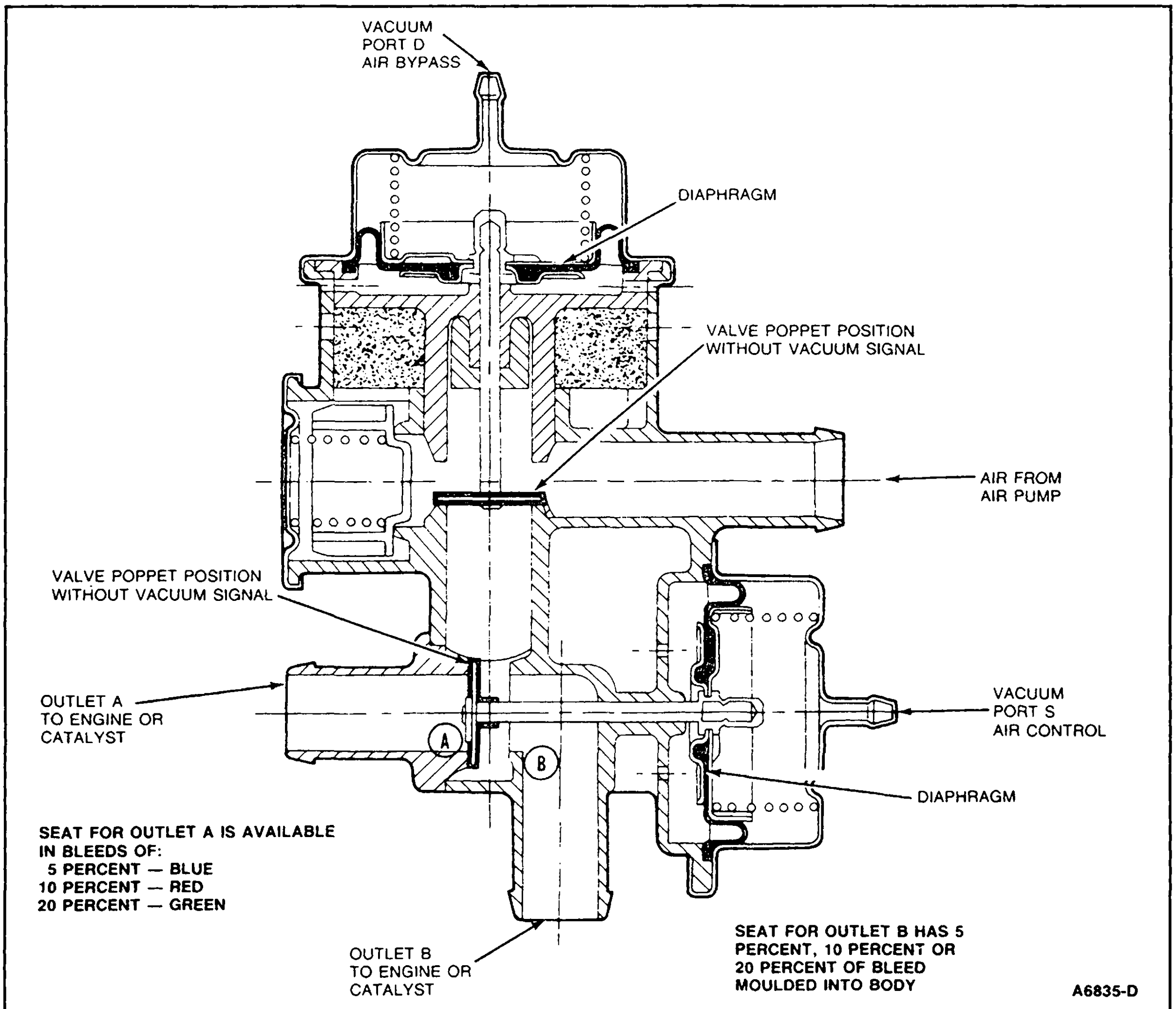


Figure 2 Valve Assembly Exhaust Air Supply Control (Normally Closed) With Bleed

6. Apply 27-34 kPa (8-10 in-Hg) vacuum to port S. With engine operating at 1500 rpm, airflow should be noted coming out of outlet A.
7. If the valve is the bleed type, some lesser amount of air will flow from outlet A or B, and the main discharge will change when vacuum is applied to port S.

NOTE: If there is a small air tap attached to the inlet tube from the air pump, airflow should be present during engine operation.

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TITLE	BASIC PART NO.	SYMBOL
DC Motor-Idle Speed Control Actuator	**9N825**	

DESCRIPTION

The DC-Motor Idle Speed Control Actuator (DC-ISCA) (Figure 1) is mounted to the fuel charging assembly and controls the idle speed including such functions as: high cam rpm, anti-diesel shutoff, dashpot and pre-positioning for next vehicle start. The DC-ISCA is driven by the EEC-IV system and includes an integral Idle Tracking Switch (ITS).

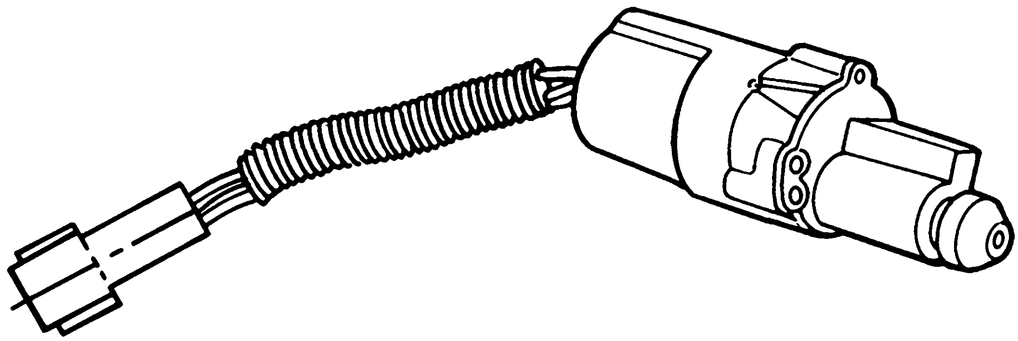

Figure 1 DC Motor-Idle Speed Control Actuator

DIAGNOSIS

Refer to the EEC-IV Quick Test, Section 14.

APPLICATIONS

PART NUMBER	ENGINE	VEHICLE
E6DF-9N825-AA	1.9L CFI	Passenger Car
E7DF-9N825-AA	2.5L HSC	Passenger Car
E8DF-9N825-AA (1988½)	1.9L CFI	Passenger Car

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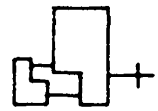
TITLE	BASIC PART NO.	SYMBOL
Dual Thermactor Air Control Solenoid Valve	9H465	 SOL V

DESCRIPTION

The dual thermactor air control solenoid valve assembly consists of two normally closed solenoid vacuum valves (TAB & TAD), one controlling the thermactor air bypass valve and the other the thermactor diverter valve. Both are vented when de-energized, sourced by the intake manifold vacuum reservoir and controlled by an EEC system (they are also discussed in the EEC and MCU Systems diagnostic procedures). Also used on 2 wheel drive/4 wheel drive vehicles and single solenoids for EGR shutoff.

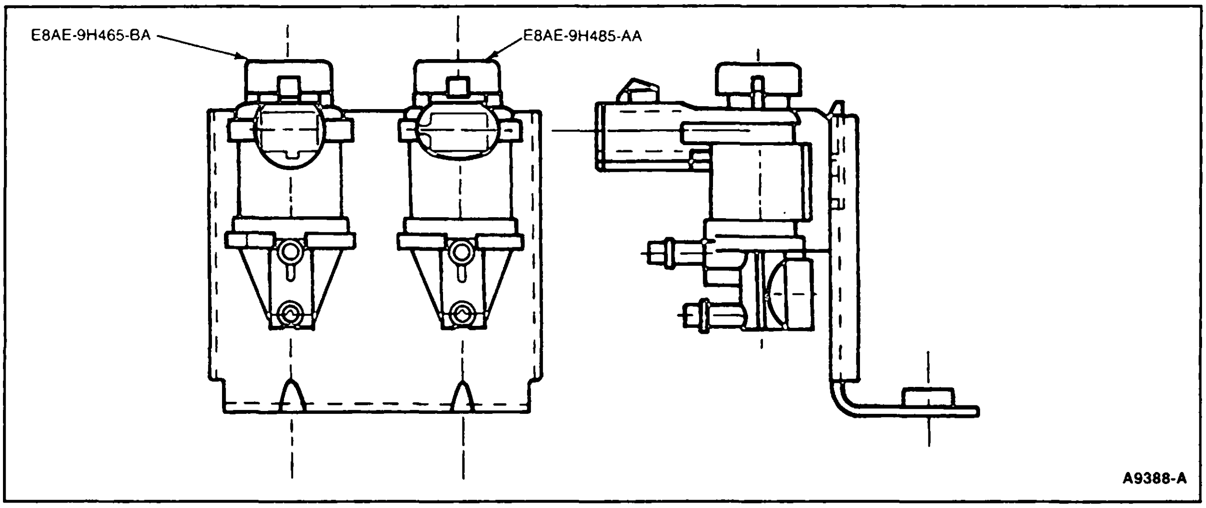


Figure 1 Dual Thermactor Air Control Solenoid Valve

DIAGNOSIS

For diagnostics, refer to the EEC-IV Quick Test, Section 14.

The function of each valve can be determined by externally energizing with vacuum sourced and output gauged. (Refer to solenoid vacuum valve, NC).

The resistance of each solenoid should be between 51 and 108 ohms when checked at the coil terminals. If the resistance is not within these values, the solenoid should be replaced.

NOTE: The valves can be expected to have a very small leakage rate when energized or de-energized. This leakage is not measurable in the field and is not detrimental to valve function.

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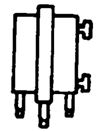
TITLE	BASIC PART NO.	SYMBOL
EGR Back Pressure Variable Transducer	**9J431**	

DESCRIPTION

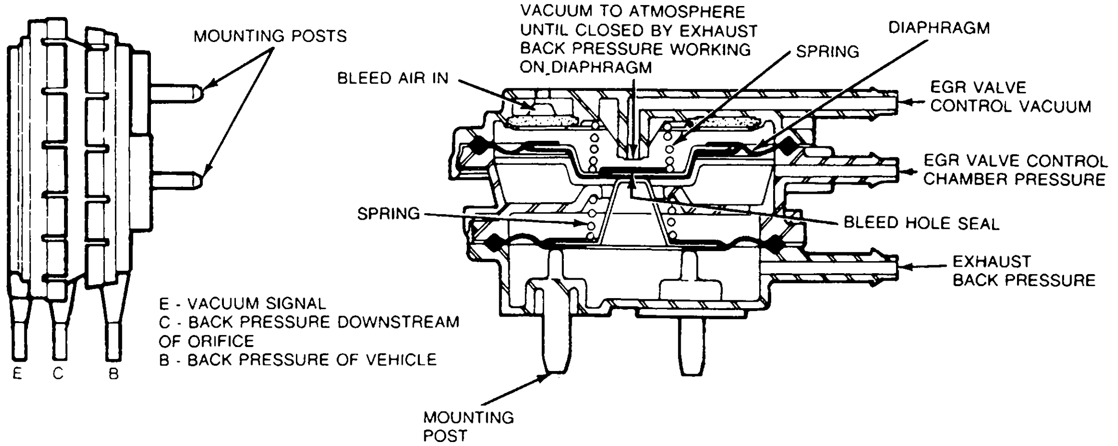


Figure 1 EGR Back Pressure Variable Transducer

DIAGNOSIS

Refer to Section 6, Exhaust Gas Recirculation (EGR) System.

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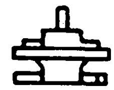
TITLE	BASIC PART NO.	SYMBOL
EGR Load Control (WOT) Valve	**9F424**	 LCV

DESCRIPTION

This valve dumps EGR vacuum at or near WOT.

The normal path between Ports A and B is vented to atmosphere when sufficient vacuum is applied to Port C.

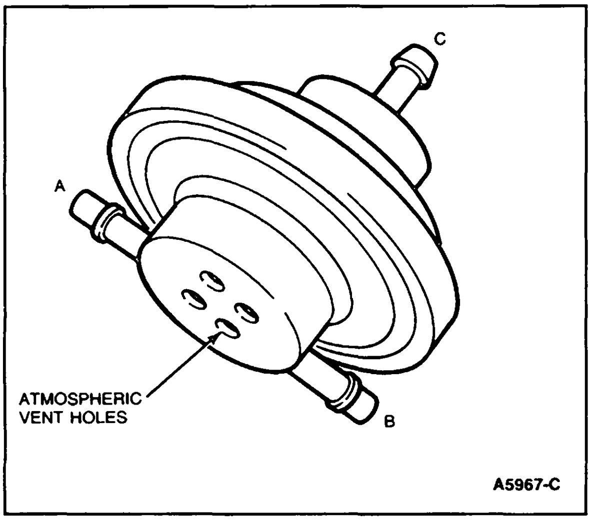


Figure 1 EGR Vacuum Load Control (WOT) Valve

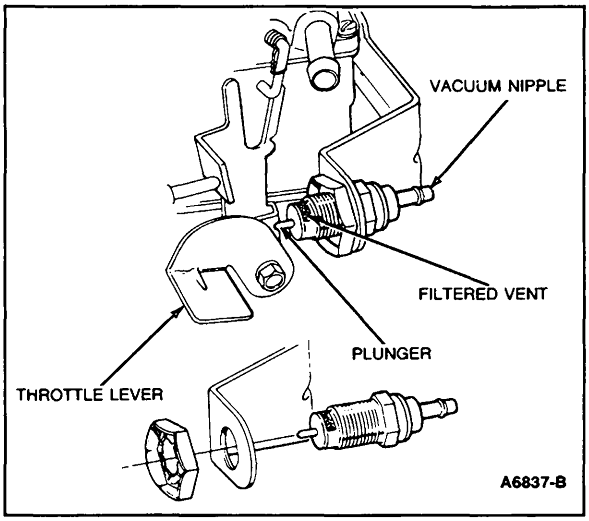


Figure 2 WOT Valve for Carter Carburetor

Functional Check

- With the engine running at normal operating temperature, set throttle on kickdown step (high cam for 2.3L).
- Connect Rotunda Vacuum Gauge 059-00008 or equivalent to the EGR side of the WOT valve, and note the reading.
- Using Rotunda Vacuum Tester 021-00014 or equivalent, apply a vacuum of at least 20.26 kPa (6 in-Hg) to the WOT venturi port (Port C).
- Gauge should drop to zero. If not, replace the valve.
- Remove test equipment and restore connections.

Functional Check (Adjustment)

Adjust so that hand pump vacuum at the vacuum nipple will drop when WOT is approached without limiting throttle travel.

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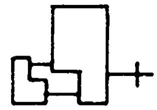
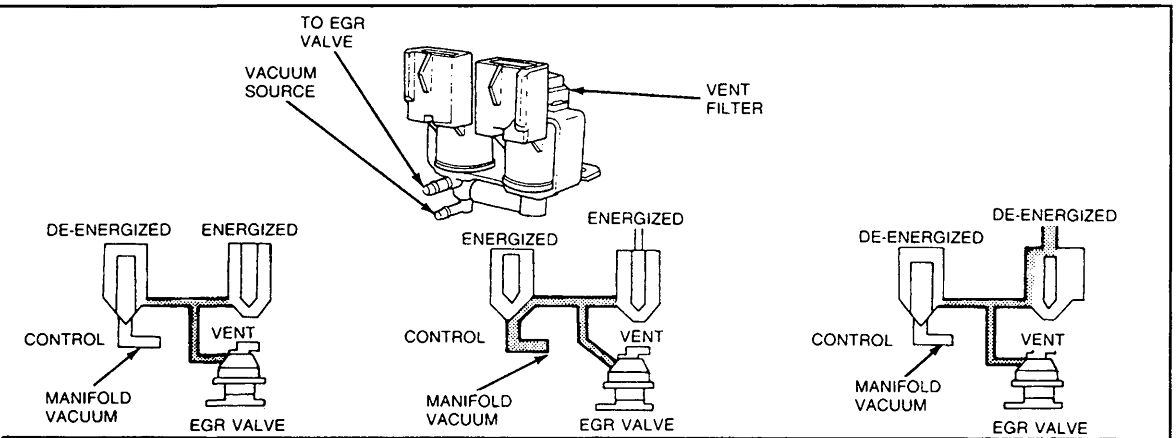
TITLE	BASIC PART NO.	SYMBOL
EGR Solenoid Vacuum Valve Assembly	**9D474**	 SOL V

DESCRIPTION

Dithering Type

The dual EGR solenoid valve assembly consists of two dithering solenoid valves. One is a vacuum valve which supplies vacuum to the sonic EGR valve when energized. The second valve is a vent valve which vents the EGR valve to the atmosphere when de-energized. Both solenoid valves receive variable duty cycle signals from ECU (EEC-IV) according to EGR requirements. A restrictor is added in vacuum valve inlet port to reduce its flow compared to vent valve. In case vacuum valve sticks open, the vent valve will be capable of venting the vacuum flow immediately without affecting the devices being controlled.

It is used with the EGR valve in EEC-IV systems.



MAINTAIN EGR FLOW	INCREASE EGR FLOW	DECREASE EGR FLOW
EXISTING VACUUM IS TRAPPED IN LINE, HOLDING EGR VALVE IN SAME POSITION	INCREASED VACUUM OPENS EGR VALVE FOR MORE EGR FLOW	EXISTING VACUUM IN LINES IS VENTED TO ATMOSPHERE A5931-D

Figure 1 EGR Solenoid Valve Assembly — Dithering Type

DIAGNOSIS

The resistance of each solenoid should be between 32 and 64 ohms. If the solenoid is not within these values, the solenoid should be replaced.

The vent valve should flow when the solenoid is de-energized.

The control valve should flow air when solenoid is energized.

Refer to the EEC-IV Quick Test, Section 14.

NOTE: The valves can be expected to have a very small leakage rate when energized or de-energized. This leakage is not measurable in the field and is not detrimental to valve function.

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TITLE	BASIC PART NO.	SYMBOL
EGR Vacuum Control Valve Filter	**9E491**	 FLTR

DESCRIPTION

The EGR vacuum control valve filter (Figure 1) is used to vent various emission control components to atmosphere. If the filter is blocked, replace it.

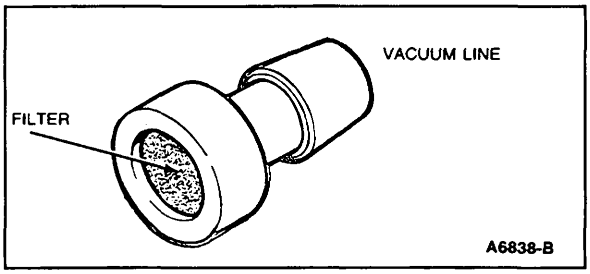

Figure 1 EGR Vacuum Control Valve Filter

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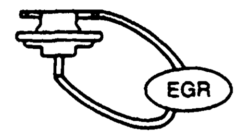
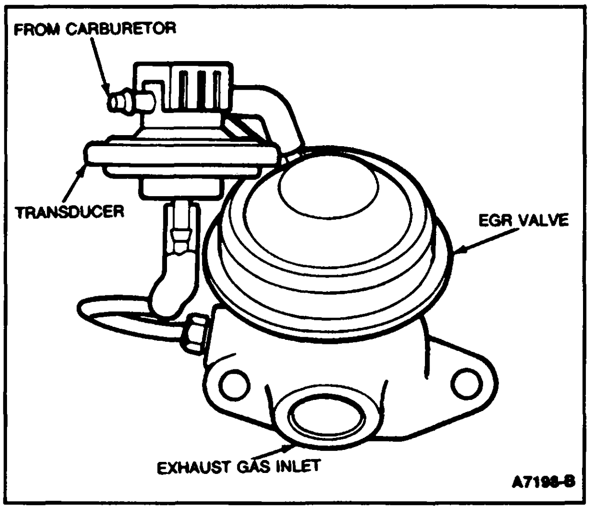
TITLE	BASIC PART NO.	SYMBOL
EGR Valve and Transducer Assembly	**9H495**	

DESCRIPTION

The Valve and Transducer Assembly (9H495) which consists of a modified ported EGR valve and a remote transducer, is used on selected engines (Figure 1). This assembly operates the same as the Integral Back Pressure Transducer EGR Valve (9D448) and is diagnosed and serviced as an assembly only. Valve function checks are the same as those for the Integral Back Pressure Transducer EGR Valve.

When servicing the assembly or any related vacuum harness, it is important to ensure proper orientation of the transducer. The nipple of the transducer attached to the metal tube from the EGR valve base must point straight down after installation. This allows drainage of exhaust gas condensation that may accumulate.



DIAGNOSIS

Refer to Section 6, Exhaust Gas Recirculation (EGR) System.

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TITLE	BASIC PART NO.	SYMBOL
EGR Valve-Electronic	**9F483**	

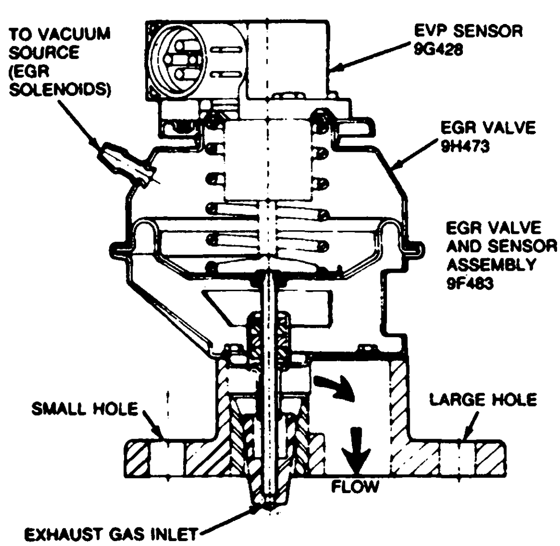
DESCRIPTION

The Electronic EGR Valve (Figure 1) is required in EEC systems where EGR flow is controlled according to computer demands by means of an EGR valve position (EVP) sensor attached to the valve.

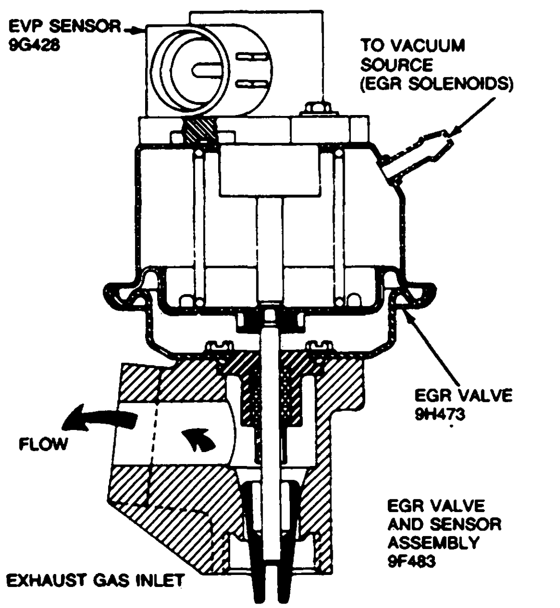
The valve is operated by a vacuum signal from the dual EGR Solenoid Valves (9D474) or the electronic vacuum regulator (9J459) which actuates the valve diaphragm.

As supply vacuum overcomes the spring load, the diaphragm is actuated. This lifts the pintle off its seat allowing exhaust gas to recirculate (flow). The amount of flow is proportional to the pintle position. The EVP sensor mounted on the valve sends an electrical signal of its position to the Electronic Control Assembly (12A650).

The Electronic EGR Valve Assembly (9F483) is not serviceable. The EVP sensor (9G428) and EGR valve (9H473) must be serviced separately.



BASE ENTRY TYPE A7192-C



SIDE (EXTERNAL) ENTRY TYPE A7191-C

DIAGNOSIS

Verify vacuum routing per the vehicle decal before proceeding to EEC-IV Quick Test, Section 14.

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TITLE	BASIC PART NO.	SYMBOL
EGR Valve-Integral Back Pressure Transducer	**9D448**	EGR

DESCRIPTION

The integral back pressure transducer EGR valve combines inputs of back pressure and EGR port vacuum into one unit. The valve requires BOTH inputs to operate. The valve will not operate on vacuum alone. The back pressure valve has two types; poppet and tapered pintle, Figure 1.

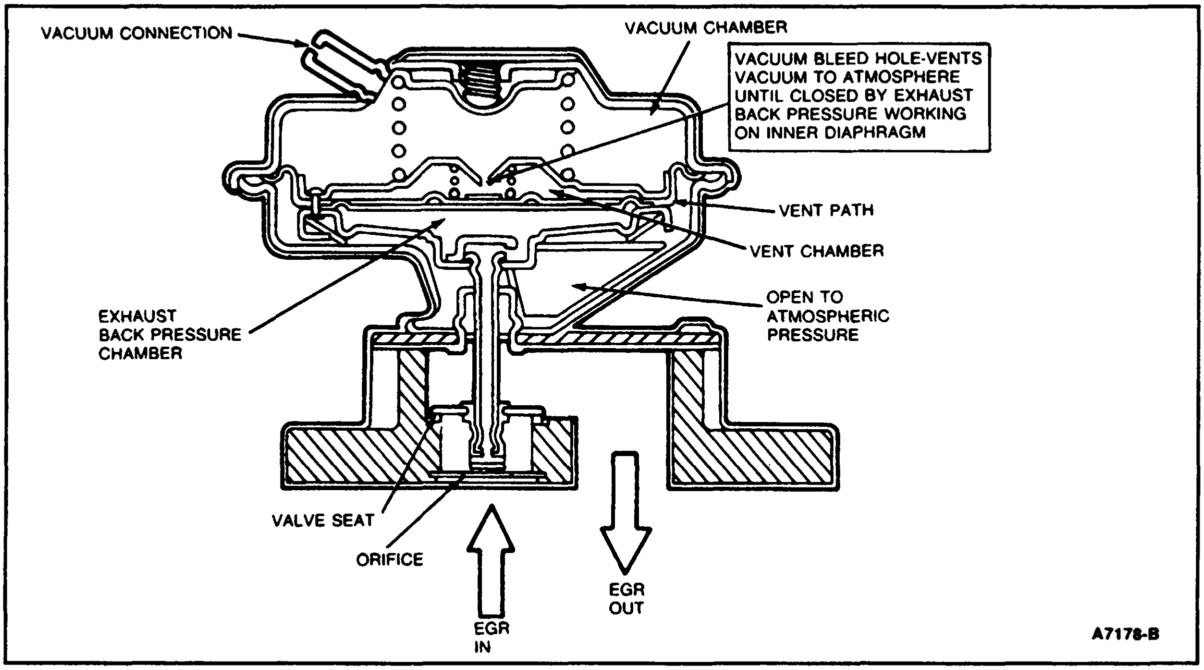

Figure 1 Integral Back Pressure Transducer EGR Valve (9D448)

DIAGNOSIS

Refer to Section 6, Exhaust Gas Recirculation (EGR) System.

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TITLE	BASIC PART NO.	SYMBOL
EGR Valve-Ported	**9D475**	EGR

DESCRIPTION

The ported EGR Valve is operated by a vacuum signal (only) from the carburetor EGR port signal which actuates the valve diaphragm. As the vacuum increases sufficiently to overcome the power spring, the valve is opened allowing EGR flow. The amount of flow is dependent on the tapered pintle or the poppet position which is a direct result of vacuum signal (Figure 1).

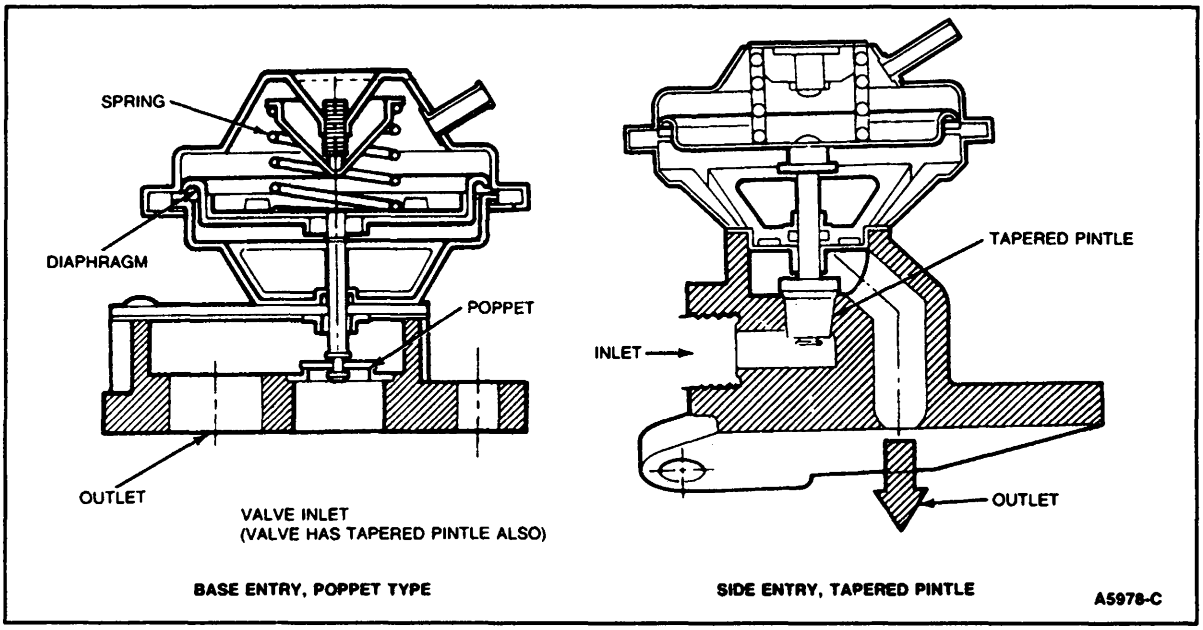

Figure 1 Ported EGR Valve (9D475)

DIAGNOSIS

Refer to Section 6, Exhaust Gas Recirculation (EGR) System.

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TITLE	BASIC PART NO.	SYMBOL
EGR Valve Position Sensor	**9G428**	

DESCRIPTION

The EVP Sensor provides EEC System with a signal indicating position of the EGR valve.

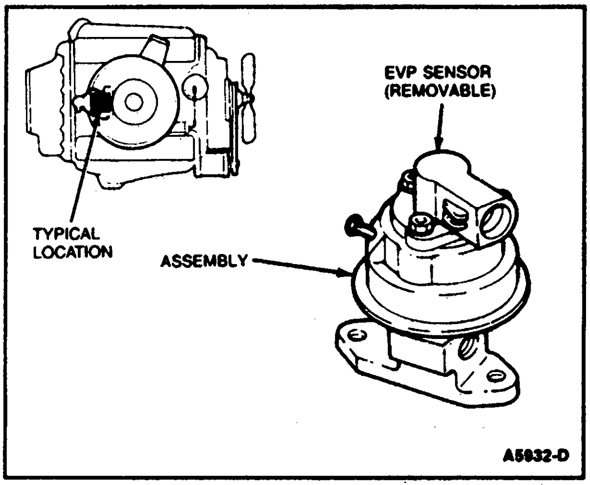

Figure 1 EGR Valve Position (EVP) Sensor

DIAGNOSIS

Refer to the EEC-IV Quick Test, Section 14.

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TITLE	BASIC PART NO.	SYMBOL
Electronic Control Assembly (FBC/CFI/EFI/SEFI)	**12A650**	

DESCRIPTION

The center of the EEC-IV system is a microprocessor called the Electronic Control Assembly (ECA). The ECA (Figure 1) receives data from a number of sensors and other electronic components (switches, relays, etc.). The ECA contains a specific calibration for optimizing emissions, fuel economy, and driveability. Based on information received and programmed into its memory, the ECA generates output signals to control various relays, solenoids, and other actuators.

The ECA in the EEC-IV system is a microprocessor like the one in the other EEC systems. One significant difference is that this ECA has the calibration module located inside the ECA assembly, unlike the EEC-III system.

The ECA is found in different locations, depending on the model. Refer to the chart for locations.

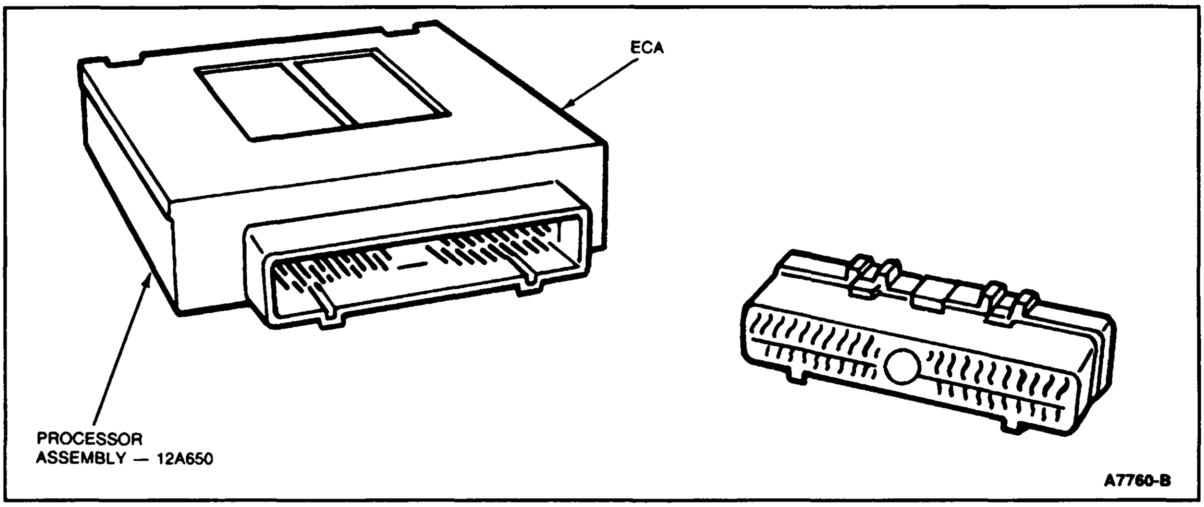

Figure 1 Electronic Control Assembly (ECA)

Vehicle	Location
Mark VII/Continental, Thunderbird/Cougar, Mustang, XR4Ti, Ranger/Bronco II	RH dash panel behind kick panel
Tempo/Topaz, Escort	Under instrument panel left of steering column
Taurus/Sable	Ahead of glove compartment
Lincoln Town Car, Ford Crown Victoria/Mercury Grand Marquis, Aerostar	LH side dash panel in passenger compartment
F-Series/Bronco	LH dash panel behind kick panel
Econoline	RH dash panel under heater blower motor

DIAGNOSIS

Refer to the EEC-IV Quick Test, Section 14.

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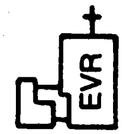
TITLE	BASIC PART NO.	SYMBOL
EGR Vacuum Regulator	**9J459**	

DESCRIPTION

The EGR Vacuum Regulator (EVR) is an electromagnetic device which controls vacuum output to the EGR valve. The EVR replaces the EGR Solenoid Vacuum Vent Valve Assembly (9D474). An electric current in the coil induces a magnetic field in the armature. The magnetic field pulls the disk closed, closing the vent and increasing the vacuum level. The vacuum source is either manifold or vacuum. As the duty cycle is increased, an increased vacuum signal goes to the EGR valve.

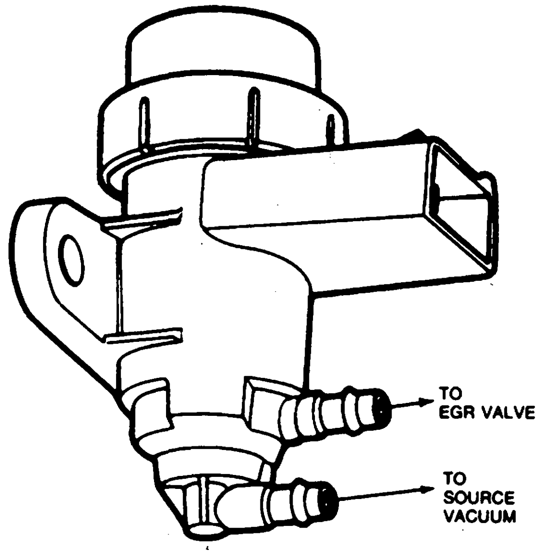


Figure 1 EGR Vacuum Regulator

DIAGNOSIS

Refer to the EEC-IV Quick Test, Section 14.

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TITLE	BASIC PART NO.	SYMBOL
Engine Coolant Temperature Sensor	**12A648**	

DESCRIPTION

The Engine Coolant Temperature (ECT) Sensor (Figure 1) detects the temperature of engine coolant and supplies the information to Electronic Control Assembly (ECA).

The ECT sensor is threaded into the heater outlet fitting or cooling passage on the engine. For engine control applications, the ECT signal is used to modify ignition timing, EGR flow, and air to fuel ratio as a function of engine coolant temperature. On electronic instrument cluster applications, the ECT output is used to control a coolant temperature indicator.

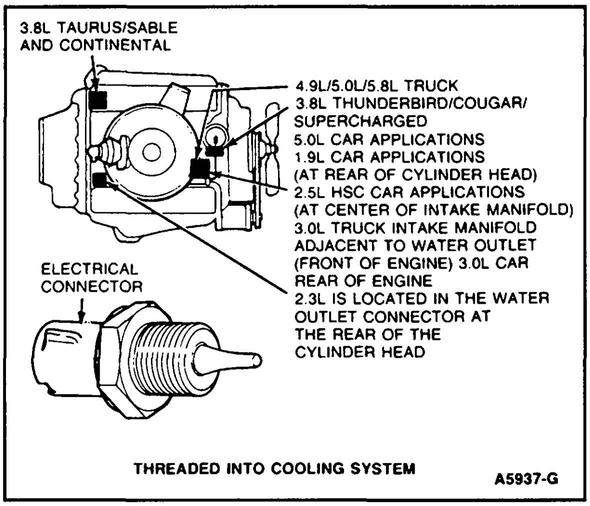

Figure 1 Engine Coolant Temperature (ECT) Sensor

DIAGNOSIS

Refer to the EEC-IV Quick Test, Section 14.

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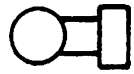
TITLE	BASIC PART NO.	SYMBOL
Exhaust Heat Control Valve	**9A427**	

DESCRIPTION

The purpose of the exhaust heat control valve (Figure 1) is to divert hot gases from the exhaust manifold to the intake manifold riser pad. Heat is transferred from the exhaust gas to the riser pad, which in turn heats the incoming fuel/air charge. There are two types currently available; the bimetal spring type and the vacuum actuated type.

Bimetal Type

Refer to Section 5 for a complete description.

Vacuum Operated

The vacuum operated heat valve functions as follows:

- When the engine is started, the valve is closed by intake manifold vacuum acting on the vacuum motor.
- The valve will stay closed until one of two conditions occurs:
  1. When the engine coolant temperature reaches a predetermined value, the vacuum supply to the heat valve is shut off by a temperature sensing vacuum switch and the heat valve opens.
  2. When the engine speed/load condition causes a drop in intake manifold vacuum below a specific value, the heat valve opens.

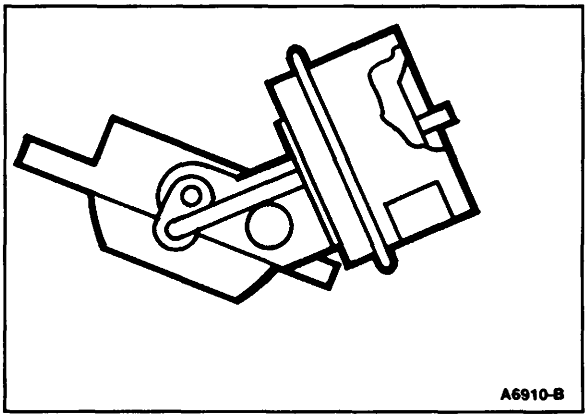


Figure 1 Exhaust Heat Control Valve

Functional Check

Apply 33.77-67.54 kPa (10-15 in-Hg) vacuum to the vacuum motor using a hand vacuum pump, Rotunda 021-00014 or equivalent, and trap for 60 seconds. The valve must close and not leak more than 6.75 kPa (2 in-Hg) and open when the vacuum is released. If it does not operate in this manner, replace the valve.

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TITLE	BASIC PART NO.	SYMBOL
Feedback Carburetor Actuator Motor	**9C908**	

DESCRIPTION

The Actuator (Figure 1) is part of the Carburetor Feedback Control System, used on 7200 model carburetors. The actuator is threaded into the carburetor body, and its actuator shaft moves a fuel metering pintle valve to produce a richer or leaner air/fuel mixture at the carburetor. In response to an electronic signal coming from the Exhaust Gas Oxygen (EGO) sensor and conditioned by the EEC (or MCU) System, the actuator shaft moves in and out.

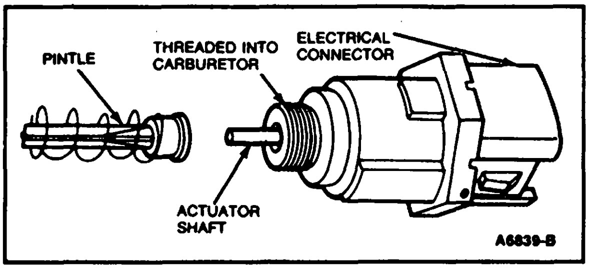

Figure 1 Feedback Carburetor Actuator Motor

DIAGNOSIS

1. Remove the FBCA motor from carburetor. Connect wiring harness to FBCA motor; turn ignition switch to RUN to extend shaft. Turn ignition switch to OFF. If FBCA shaft does not extend, replace FBCA motor and retest.
2. Push FBCA motor shaft back in by hand. If shaft will not push in, replace FBCA motor and retest.
3. Remove and clean pintle valve, spring and carburetor passage with choke cleaner and a small brush.
4. Reinstall pintle, spring a FBCA motor. Tighten FBCA motor to 8-10 lb-ft.
5. Retest according to appropriate Quick Test. Refer to Section 14.
6. Check/reset curb idle, if necessary.

NOTE: FBCA motor is partly diagnosed as a part of the 5.8L MCU electronic system. Refer to the 5.8L FBC Police and Canadian Trailer Tow MCU Diagnosis Manual.

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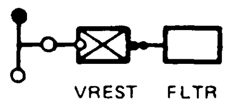
TITLE	BASIC PART NO.	SYMBOL
Filter Assembly — Vacuum Vent	**9F474**	

DESCRIPTION

The Vacuum Vent Filter (Figure 1) is used to filter air being drawn into the vacuum system when a vacuum bleed is required. It is a nylon tee with a restrictor and an open cell foam on one leg.

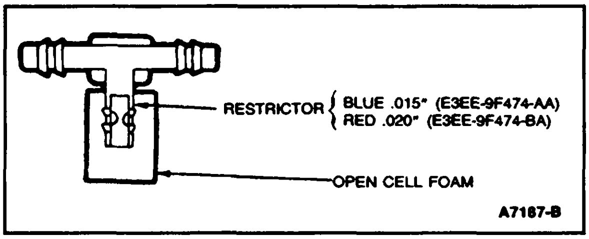


Figure 1 Vacuum Vent Filter Assembly

DIAGNOSIS

If the filter appears to be dirty, wash it in an appropriate solvent.

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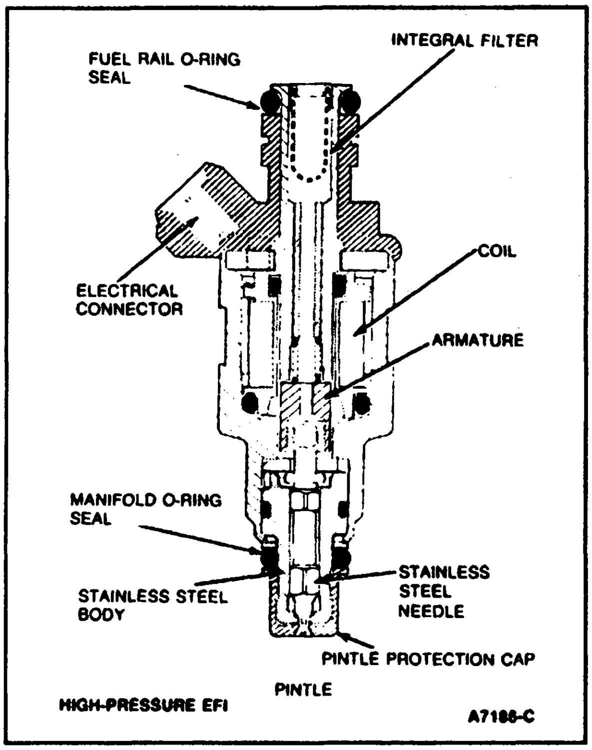
TITLE	BASIC PART NO.	SYMBOL
Fuel Injector	**9F593**	

DESCRIPTION

The Fuel Injector (Figure 1) is a solenoid operated valve that meters fuel flow to the engine. The injector is opened and closed a constant number of times per crank revolution. The amount of fuel is controlled by the length of time it is held open.

The injector is normally closed and is operated by a signal from the Electronic Engine Control (EEC) module.



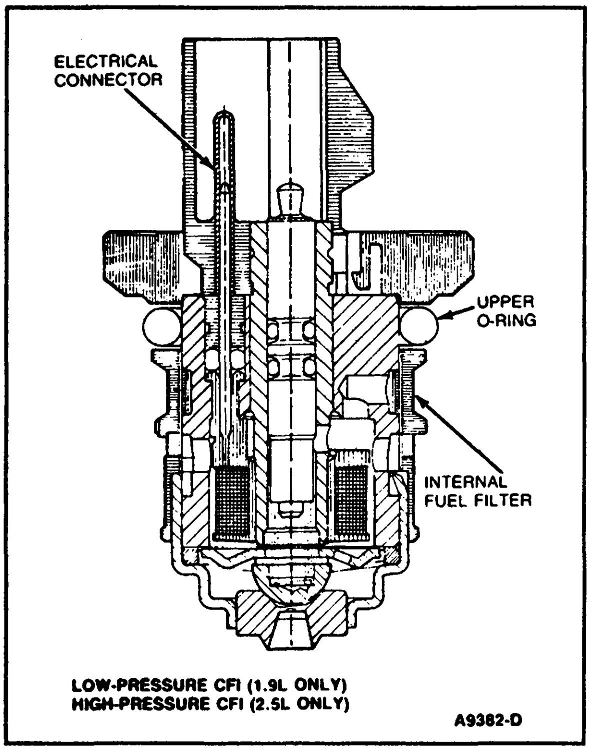


Figure 1 Fuel Injectors

DIAGNOSIS

NOTE: Low-pressure injectors have low coil resistance. High-pressure injectors can have either high or low coil resistance. Function can be adversely affected by using the wrong injectors.

NOTE: Do not apply battery voltage directly to the injector electrical connector terminals. The solenoid may be damaged internally in a matter of seconds.

For EFI injectors, refer to Section 4, Fuel Injector Testing/Cleaning.

Refer to the EEC-IV Quick Test, Section 14.

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TITLE	BASIC PART NO.	SYMBOL
Fuel Pressure Regulator — EFI	**9C968**	F P R

DESCRIPTION

The EFI Fuel Pressure Regulator (Figure 1), is attached to the fuel supply manifold assembly upstream of the fuel injectors. It regulates fuel pressure supplied to the injectors.

- The regulator is a diaphragm-operated relief valve in which one side of the diaphragm is exposed to fuel pressure and the other side is subjected to intake manifold pressure for multi-point fuel injection (EFI) and atmospheric pressure for single point injection (CFI).
- The nominal fuel pressure is controlled by a spring preload applied to the diaphragm. By exposing the top side of the diaphragm to manifold pressure, a constant pressure drop is maintained across the injectors, for all modes of operation, of a multi-point fuel injection system (EFI).
- Fuel in excess of that used by the engine is bypassed through the regulator and back to the fuel tank.

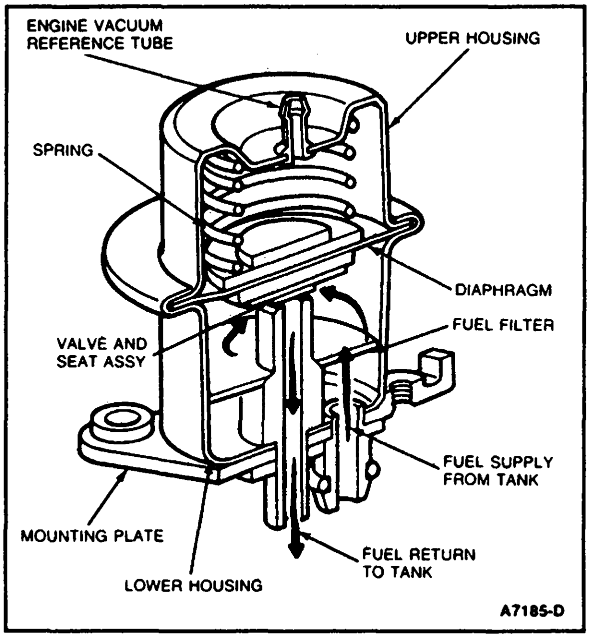

Figure 1 Fuel Pressure Regulator (EFI)

DIAGNOSIS

Refer to Section 11, Fuel Delivery Systems.

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TITLE	BASIC PART NO.	SYMBOL
Fuel-Vapor Separator	**9C369**	 SA-FA

DESCRIPTION

The Fuel-Vapor Separator (Figure 1) is used in vacuum systems to prevent fuel migration to a vacuum operated device.

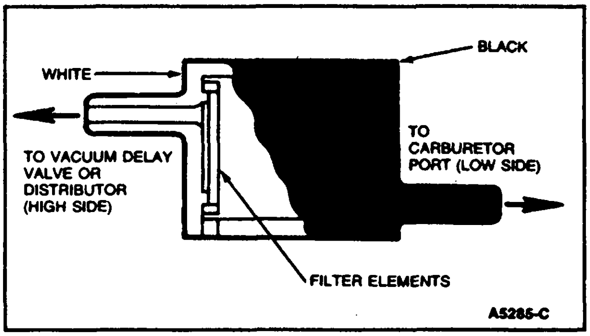

Figure 1 Fuel-Vapor Separator

DIAGNOSIS

NOTE: Separator requires positive orientation to ensure that any fuel collected will drain back to the carburetor.

If separator becomes cracked or clogged, replace the separator.

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TITLE	BASIC PART NO.	SYMBOL
Heated Exhaust Gas Oxygen Sensor	**9F472**	

DESCRIPTION

The Heated Exhaust Gas Oxygen Sensor (HEGO) (Figure 1) supplies the ECA with a signal which indicates a rich or lean condition during engine operation.

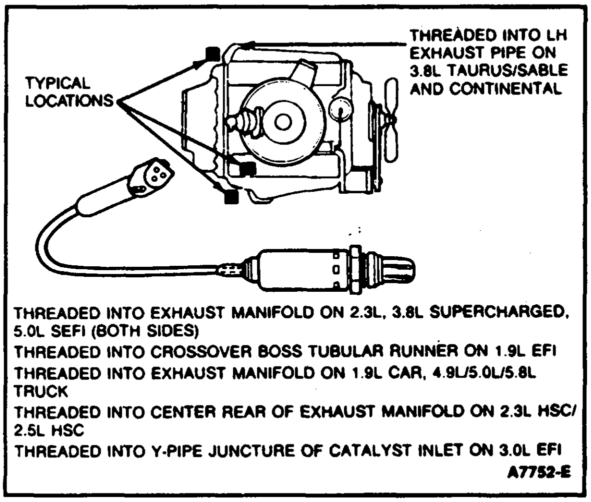

Figure 1 Heated Exhaust Gas Oxygen Sensor (HEGO)

DIAGNOSIS

Refer to the EEC-IV Quick Test, Section 14.

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TITLE	BASIC PART NO.	SYMBOL
Heated Exhaust Gas Oxygen Sensor	**9F472**	

DESCRIPTION

The HEGO Sensor supplies ECA with a signal which indicates either a rich or lean condition during engine operation.

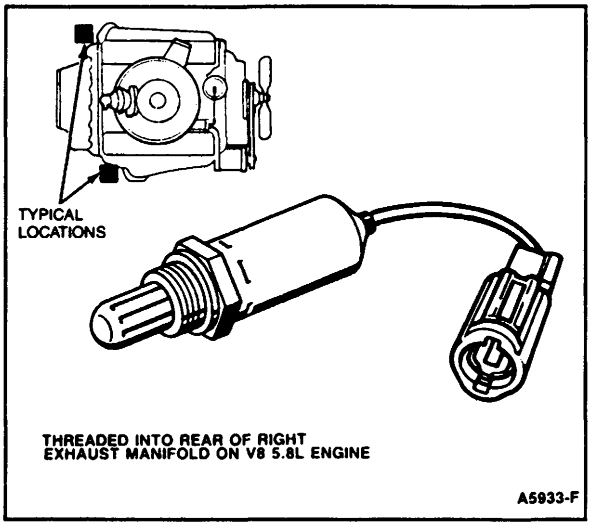

Figure 1 Typical Heated Exhaust Gas Oxygen (EGO) Sensor

DIAGNOSIS

Refer to the EEC-IV Quick Test, Section 14.

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TITLE	BASIC PART NO.	SYMBOL
Ignition Barometric Pressure Switch	**12A243**	

DESCRIPTION

The Ignition Barometric Pressure Switch (Figure 1) is used to control spark timing and/or other electrical devices in response to changes in barometric pressure (i.e., altitude). When controlling spark timing, the ignition module (12A244) is made to vary the spark timing by an amount determined by calibration resistors in the switch assembly. In normal operation, spark timing is increased for vehicle operation above the switching point (increasing altitude) and retarded for vehicle operation below the switching point (decreasing altitude). When controlling other electrical devices, only On/Off control is provided; with On (switch closed) above the switching point and Off (switch open) below the switching point. Some switch assemblies control both spark timing and another device (dual switch assembly) and other switch assemblies control only one or the other (single switch assembly).

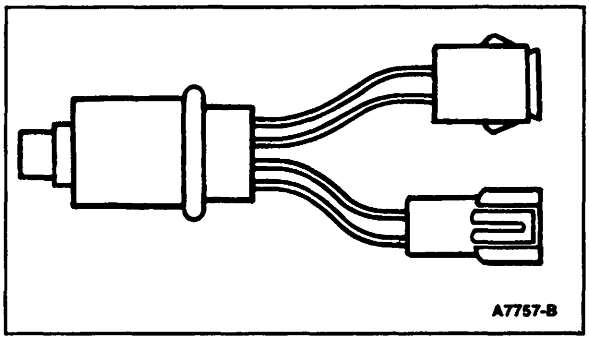

Figure 1 Ignition Barometric Pressure Switch

DIAGNOSIS

- Dual switch assembly shown.
- Attaching brackets vary according to installation requirements.
- Connectors may vary.

Part Number	Resistance (Ohms) Below 3,000 Feet	Resistance (Ohms) Above 4,600 Feet
E2AE-12A243-AA	Greater than 200,000	Less than 1
E43E-12A243-AA	2,820-2,920	1,750-1,850
E4DE-12A243-AB	2,560-2,660	1,960-2,060
E4EE-12A243-AA	Greater than 200,000	Less than 1

Either resistance value is correct if altitude is between 3,000 and 4,600 feet.

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TITLE	BASIC PART NO.	SYMBOL
Inertia Switch	**9341**	

DESCRIPTION

The Inertia Switch (Figure 1) is used in conjunction with an electric fuel pump. The purpose of the inertia switch is to shut off the fuel pump in the event of an accident. It consists of a steel ball held in place by a magnet. When a sharp impact occurs, the ball breaks loose from the magnet, rolls up a conical ramp and strikes a target plate which opens the electrical contacts of the switch and thereby shuts off the electric fuel pump. Once the switch is open, it must be manually reset before re-starting the vehicle. The location of the switch is discussed in the Owner Guide.

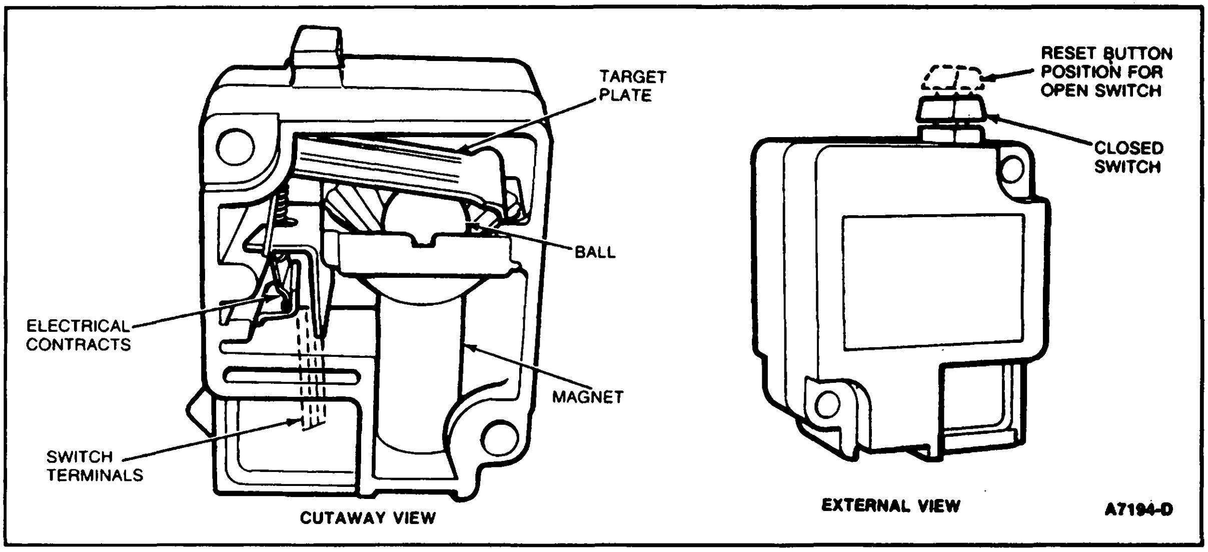

Figure 1 Inertia Switch

DIAGNOSIS

Reset Instructions

1. Turn ignition to OFF.
2. Check for leaking fuel in the engine compartment, fuel lines and tank(s).
3. If no fuel leak is apparent, reset the switch by pushing the reset button on the top of the switch.
4. Turn ignition switch to START for a few seconds, then to OFF.
5. Again, check for leaking fuel.

WARNING

IF YOU SEE OR SMELL GASOLINE AT ANY TIME OTHER THAN DURING FUELING, DO NOT RESET THE SWITCH.

Functional Check

Push down on the reset button to make sure the switch is closed.

Use DVOM, Rotunda 007-00001 or equivalent, with LOS button On and measure voltage across both terminals of the inertia switch. If DVOM reading is greater than 0.3V, replace the inertia switch.

NOTE: In the closed position, the button can be depressed an additional 1/16-inch against a spring. This is a normal condition and does not adversely effect the switch operation.

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TITLE	BASIC PART NO.	SYMBOL
Emission Maintenance Warning (EMW) And Inferred Mileage Sensor (IMS) Combo Module	**12B514**	

DESCRIPTION

The Emission Maintenance Warning (EMW) Module (Figure 1) and the Inferred Mileage Sensor (IMS) Combo Module (Figure 2) is mounted in the instrument panel. The EMW function activates the Check Engine Light (CEL) on the instrument panel at 2,000 hours (60,000 miles). The light indicates the emission maintenance should be performed. The IMS function directs the EEC-IV module to switch to a revised secondary air routine at 750 hours (22,500 miles).

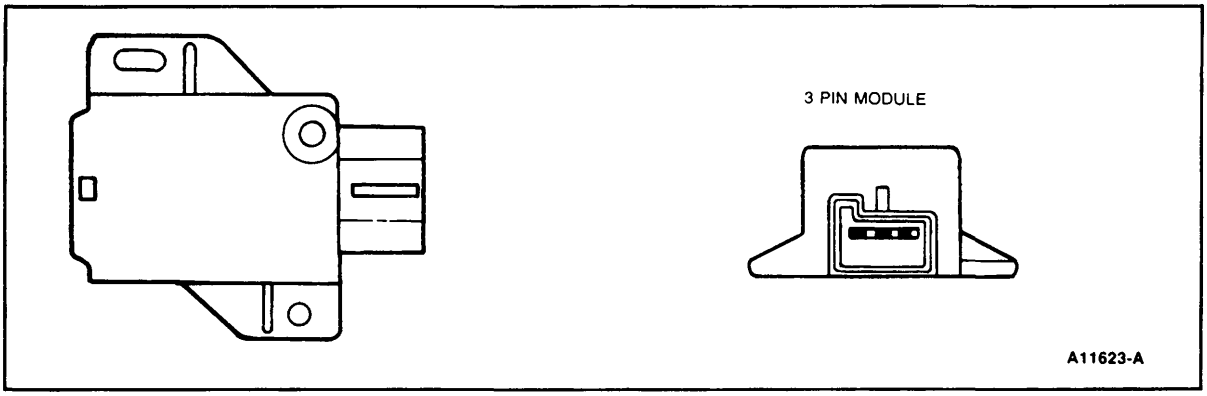

Figure 1 Emission Maintenance Warning (EMW) Module

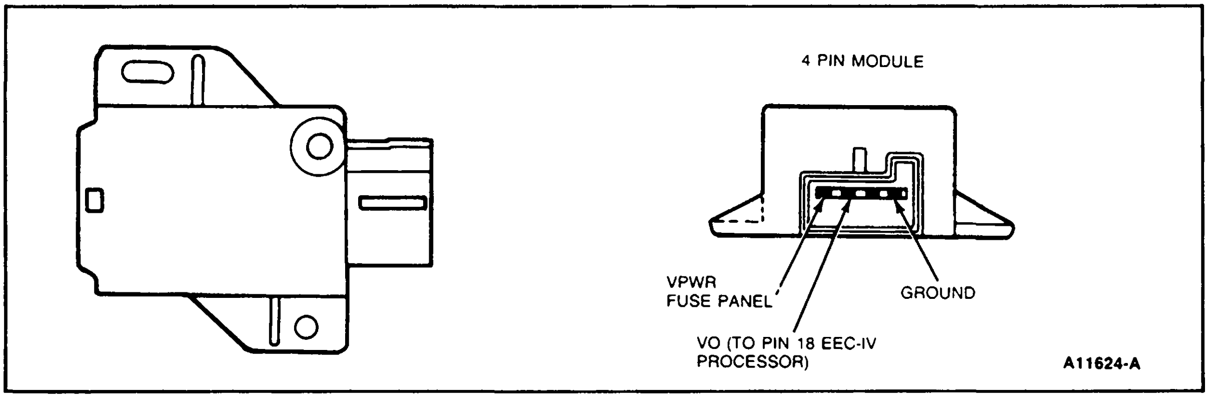

Figure 2 Inferred Mileage Sensor (IMS) Combo Module

DIAGNOSIS

EMW — Refer to Section 12 for Pinpoint Testing.

IMS — Prior to 22,500 miles, Vo < 0.4 V. After 22,500 miles, Vo - 4-6 V.

APPLICATIONS:

PART NUMBER	ENGINE	VEHICLE	MODULE
E5TF-12B514-AA	6.1L, 7.0L	F, B, Series Heavy Truck	EMW
E7UF-12B514-AA	5.8L	Econoline	IMS
E79F-12B514-AA	5.8L	F-Series/Bronco	IMS

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TITLE	BASIC PART NO.	SYMBOL
Integral Relay Control Module	**12B577**	

DESCRIPTION

The Integral Relay Control Module (IRCM) interfaces with the EEC-IV to provide control of the cooling fan, A/C clutch and the fuel pump. The module also incorporates the EEC power relay to provide power to the EEC-IV system.

The module is designed specifically for underhood application. The limits of operation are as follows:

Operating Temperature .... – 30°C to 100°C
Storage Temperature .... – 40°C to 125°C
Operating Voltage .... 7 to 17 volts

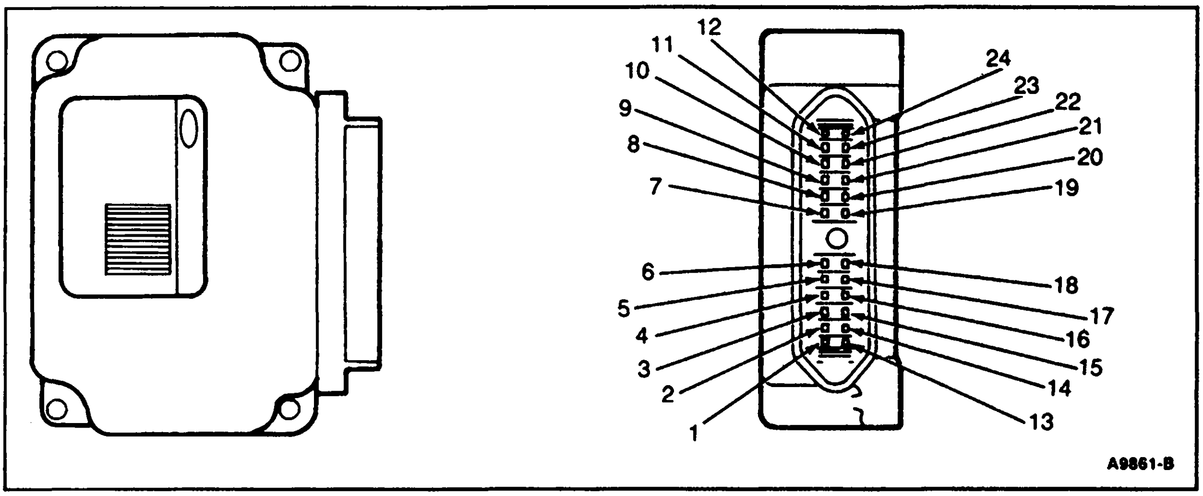

Figure 1 Integral Relay Control Module

DIAGNOSIS

Refer to EEC-IV Quick Test, Section 14.

Powertrain Model Application	Controller -12B577-	Bracket and Control Assembly — 12B581-	Vehicle Location
2.3L TC M/T and A/T Merkur	E7DF-CB	E7SF-AA	RH Fender Apron at Shock Tower
2.5L HSC M/T Taurus	E7DF-BB	E7DF-BA	Radiator Support
2.5L HSC A/T Taurus/Sable	E7DF-AB	E7DF-AA	Radiator Support
3.0L A/T Taurus/Sable	E7DF-CB	E7DF-CA	Radiator Support
3.0L SHO	E9DF-AA	E7DF-CA	Radiator Support
3.8L Supercharged	E9SF-AA	E9SF-AA	Radiator Support
3.8L A/T Taurus/Sable	E8DE-AA	E8DE-AA	Radiator Support
3.8L T-Bird/Cougar	E9SF-AA	E9SF-AA	Radiator Support

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TITLE	BASIC PART NO.	SYMBOL
Knock Sensor	**12A699**	

DESCRIPTION

The Knock Sensor (Figure 1) is a piezoelectric accelerometer with the sensor designed to resonate at approximately the same frequency as the engine knock frequency. The sensor uses the resonant frequency to mechanically amplify the vibrations. This method allows relatively large signals to be achieved without electrical amplification and with small package size.

The sensor has a thin circular piezoelectric ceramic disk which is bonded to a metal diaphragm. Electrical connections are made through a two pin integral connector.

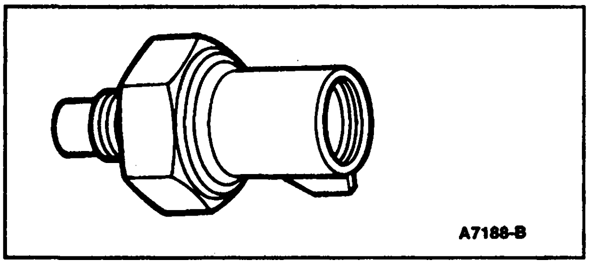

Figure 1 Knock Sensor

DIAGNOSIS

Refer to the EEC-IV Quick Test, Section 14.

Part Number	Resonant Frequency	Color	Planned Usage	Thread
E3AF-AA	5.4K	Black	5.8L Ford/Mercury	1/2-13 UNC
E3SF-AA	5.7K	Gray	2.3L (Turbo) Merkur	M12 × 1.5mm-6g
E6TF-AA	6.45K	Black	2.9L Ranger/Bronco II	M10 × 1.5mm-6g
E5TF-AA	6.0K	Black	3.0L Taurus/Sable, Aerostar	M10 × 1.5mm-6g
E7TF-AA	9.5K	White	4.9L 5.0L/5.8L Econoline/Bronco	M12 × 1.5mm-6g
E9SF-AA	5.7K	Gray	3.8L Supercharged T-Bird/Cougar	M10 × 1.5mm-6g

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TITLE	BASIC PART NO.	SYMBOL
Manifold Pressure Warning Indicator Switch Assembly	**10D883**	

DESCRIPTION

Turbocharged Vehicles Only (Merkur XR4Ti)

The switch assembly has a pressure switch to trigger the over-boost lamp (red) and a buzzer on the instrument panel (Figure 1).

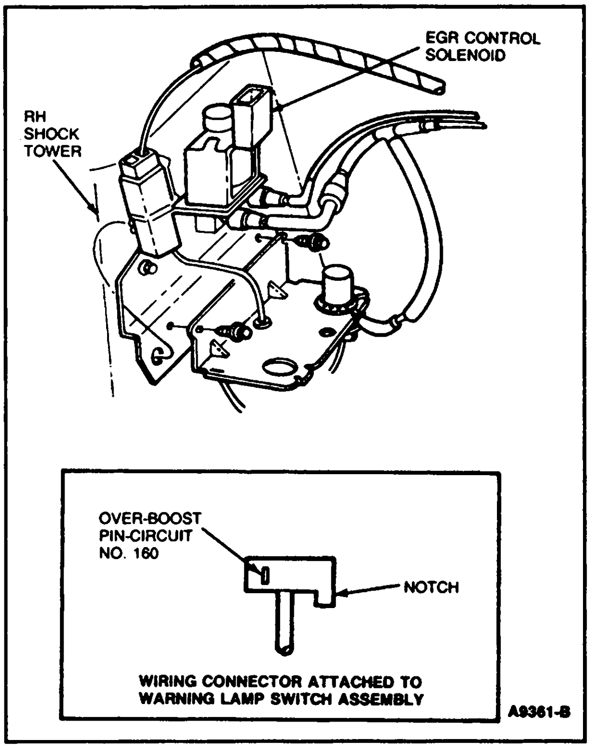

Figure 1 Manifold Pressure Warning Indicator Switch Assembly

DIAGNOSIS

Disconnect the wiring harness connector from the warning lamp switch assembly. Using a test lamp or equivalent device, determine if the pin is connected to ground when pressure is applied as follows:

1. Over-boost lamp switch check: The other pin on the connector, joining to Circuit 160, should be connected to ground when a pressure of 17.5 psi or greater is applied.

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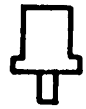
TITLE	BASIC PART NO.	SYMBOL
Manifold Absolute Pressure	**9F479**	

DESCRIPTION

The MAP sensor measures manifold vacuum using a frequency. This gives the ECA information on engine load.

It is used as a barometric sensor for altitude compensation, updating the ECA during Key On Engine Off and every wide-open throttle.

The ECA uses MAP for:

- Spark advance
- EGR flow
- Air/fuel ratio

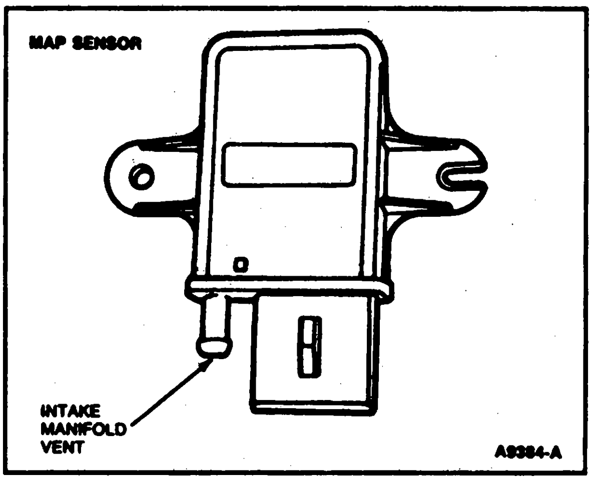


Figure 1 Manifold Absolute Pressure Sensor

DIAGNOSIS

Refer to the EEC-IV Quick Test, Section 14.

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TITLE	BASIC PART NO.	SYMBOL
Mass Airflow Sensor	**12B579**	

DESCRIPTION

The sensor directly measures the mass of the air flowing into the engine. The sensor output is used by the ECA to calculate the injector pulse width for stoichiometry. The sensing element is a thin platinum wire wound on a ceramic bobbin and coated with glass. This "hot wire" is maintained at 200°C above ambient temperature as measured by a constant "cold wire".

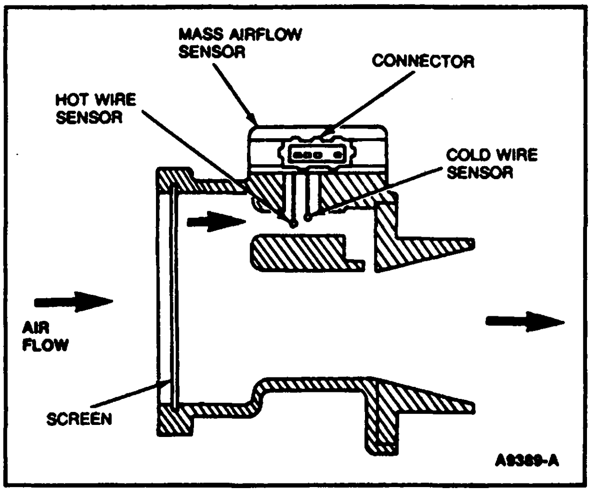

Figure 1 Mass Airflow Sensor Assembly

DIAGNOSIS

Refer to the EEC-IV Quick Test, Section 14.

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TITLE	BASIC PART NO.	SYMBOL
Pressure Feedback Electronic EGR Valve	**9D460**	EGR

DESCRIPTION

The Pressure Feedback Electronic (PFE) EGR valve is a conventional ported EGR valve. The valve is used in conjunction with a pressure transducer (9J460) which supplies pressure feedback to the EEC-IV processor. The EGR flow rate is proportional to the pressure drop across a remotely mounted sharp edged orifice.

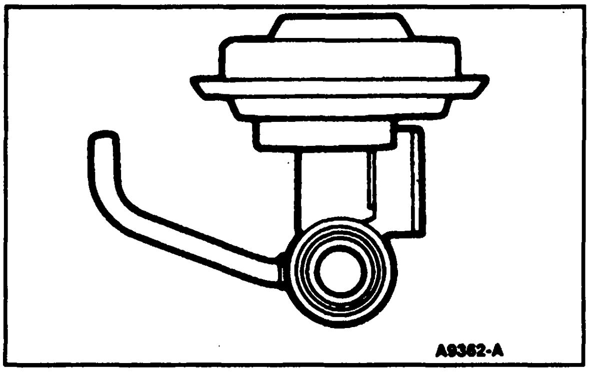

Figure 1 Typical Pressure Feedback Electronic EGR Valve

DIAGNOSIS

Refer to Section 6, Exhaust Gas Recirculation (EGR) System.

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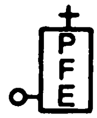
TITLE	BASIC PART NO.	SYMBOL
Pressure Feedback Electronic EGR Transducer	**9J460**	

DESCRIPTION

The Pressure Feedback Electronic (PFE) EGR transducer converts a varying exhaust pressure signal into a proportional analog voltage which is digitized by the EEC-IV processor. The EEC-IV processor uses the signal received from the PFE transducer to complete the optimum EGR flow.

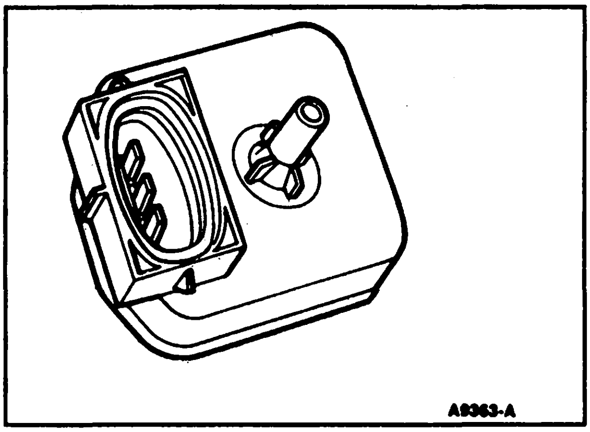


Figure 1 Pressure Feedback Electronic EGR Transducer

DIAGNOSIS

Refer to the EEC-IV Quick Test, Section 14.

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TITLE	BASIC PART NO.	SYMBOL
Relay Assembly EEC (Power) EEC (Power) Time Delay	**12A646**	

DESCRIPTION

There are two types of relays: the power relay and the time delay power relay. The time delay relay has a delay of 5 to 10 seconds and is used with an actuator assembly throttle control. Both relay types consist of a movable contact in the normally open position. All power relays (except time delay) have the same design with a different bracket attachment.

Function

EEC power relays are in parallel with the ignition switch and provide power to the EEC module. Power relays also provide reverse battery protection and increased load handling to improve ignition switch reliability.

Specifications	Time Delay Power Relay	Power Relay
Pull-in Voltage	9V DC max	8.5V DC max
Millivolt Drop	15 mv/amp	10 mv/amp
Coil Current	220 ma @ 14.4V DC	220 ma @ 12.8V DC
Drop-out Voltage	4.5V DC	1-4V DC

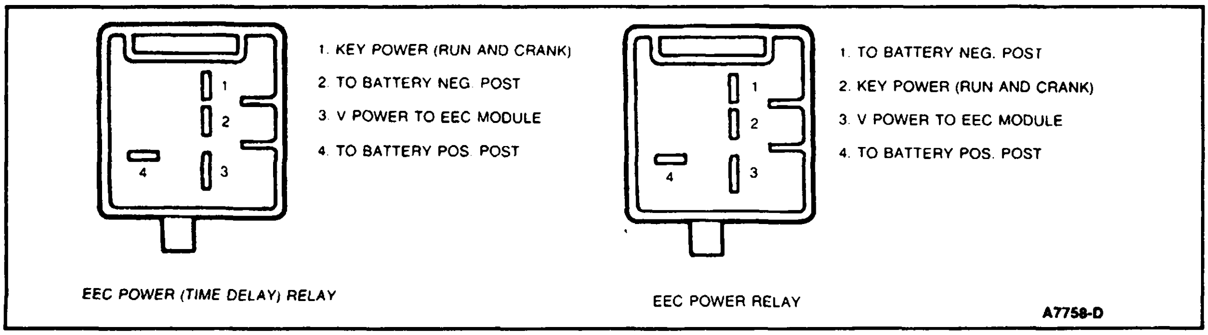

Figure 1 Relay Assembly

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TITLE	BASIC PART NO.	SYMBOL
Relay Assembly EEC (Power) EEC (Power) Time Delay	**12A646**	

EEC POWER RELAY LOCATION AND APPLICATIONS

PART NUMBER AND RELAY TYPE (Power or Time Delay)	SYSTEM APPLICATION(S)	LOCATION(S)
• E6EF-12A646-B1A/B2A Power Relay	Escort 1.9L EFI	Passenger compartment under dash on module bracket.
• E3UF-12A646-B1A/B2A Power Relay	Econoline 4.9L/5.0L/5.8L EFI	— Under dash on module bracket. — Under dash on right cowl.
• E3VF-12A646-B1A/B2A Power Relay	Ranger/Bronco II 2.3L EFI Bronco II/Ranger 2.9L EFI	Engine compartment.
• E35F-12A646-B1A/B2A Power Relay	Thunderbird/Cougar 3.8L EFI Thunderbird/Cougar/Mustang 5.0L SFI Mustang 2.3L OHC EFI	Passenger compartment under dash on right cowl assembly.
• E3AF-12A646-B1A/B2A Power Relay	Ford/Mercury 5.0L SFI Lincoln Town Car 5.0L SFI Continental/Mark VII 5.0L SFI Aerostar 2.3L/3.0L EFI F-Series/Bronco 4.9L/5.0L	Engine compartment doghouse.
• E3AF-12A646-B1A/B2A Power Relay	Heavy Truck 7.5L	Engine compartment doghouse.
• E7EF-12A646-A1A Time Delay	Escort 1.9L CFI	Passenger compartment under dash on right cowl assembly.
• E43F-12A646-B1A Time Delay	Tempo/Topaz 2.3L HSC EFI	Passenger compartment under dash behind glove compartment.

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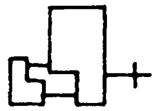
TITLE	BASIC PART NO.	SYMBOL
Solenoid Vacuum Valve Assembly	**9D474**	 SOL V

DESCRIPTION

Normally Closed

The normally closed solenoid valve assembly (Figure 1) consists of two vacuum ports with an atmospheric vent. The valve assembly can be with or without control bleed. The outlet port of the valve is opened to atmospheric vent and closed to the inlet port when de-energized. When energized, the outlet port is opened to the inlet port and closed to atmospheric vent. The control bleed is provided to prevent contamination entering the solenoid valve assembly from intake manifold. This solenoid valve assembly is used on Throttle Kicker and EGR Shutoff.

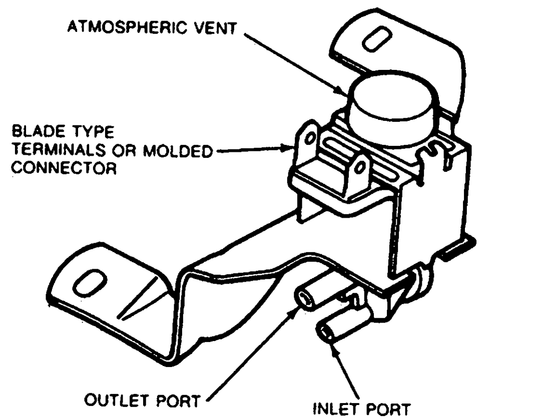


Figure 1 Typical Solenoid Valve Assembly— Normally Closed

DIAGNOSIS

The ports should flow air when the solenoid is energized.

The solenoid resistance when checked at the terminals should be between 51 and 108 ohms. If the solenoid resistance is not within these values, the solenoid should be replaced.

Refer to the EEC-IV Quick Test, Section 14.

NOTE: The valve can be expected to have a very small leakage rate when energized or de-energized. This leakage is not measurable in the field and is not detrimental to valve function.

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TITLE	BASIC PART NO.	SYMBOL
Temperature Vacuum Switch	**9A995**	TVS

DESCRIPTION

The bimetal disc in the switch orients itself in one of two positions, depending on its temperature. One position allows free airflow in the vacuum line; the other position blocks airflow by sealing itself against the O-ring.

This device is mounted remotely to or directly on the air cleaner. It responds to the temperature of the inlet air heated by the exhaust manifold.

The switching temperature is below the range of normal, stabilized engine operating temperatures.

The TVS may be used to control the vacuum signal to the Thermactor dump valve, reducing emissions.

The normally open TVS may block the purge vacuum signal to provide satisfactory cold drive ability and reduce cold emissions. Also, the EGR may be held off to provide satisfactory cold driveability.

The normally closed TVS may allow cold spark advance to provide satisfactory driveaway.

TYPICAL TEMPERATURE VACUUM SWITCH (TVS)

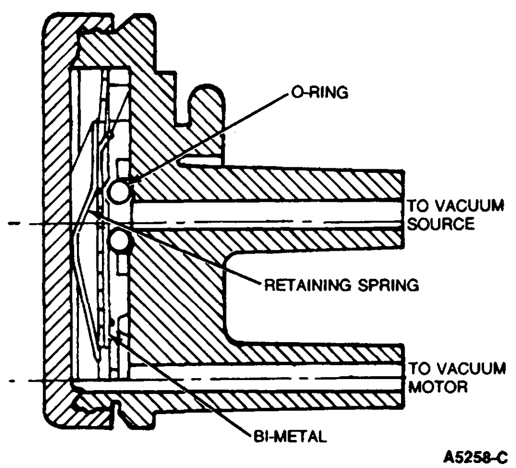

Figure 1 Temperature Vacuum Switch (TVS)

DIAGNOSIS

1. Apply 54 kPa (16 in-Hg) vacuum, using Rotunda Vacuum Tester 021-00014 or equivalent, to motor side and trap.
   a. With the white TVS cooled to 10°C (50°F), the normally open TVS must hold 16.9 kPa (5 in-Hg) for 30 seconds. The white TVS should not hold vacuum above 24.4°C (76°F).
   b. With the brown colored TVS cooled to −9.4°C (15°F), the normally open TVS must hold 16.9 kPa (5 in-Hg) for 30 seconds. The brown TVS should not hold vacuum above −1.1°C (30°F).
   c. The normally closed, red TVS should not hold vacuum at or below 10°C (50°F), however, it must hold 16.9 kPa (in-Hg) vacuum for 30 seconds above 18.3°C (65°F).
   d. With the purple TVC cooler to 4.4°C (40°F), the normally open TVS must hold 16.9 kPa (5 in-Hg) for 30 seconds, the purple TVS should not hold vacuum above 12.8°C (55°F).

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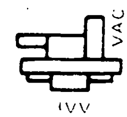
TITLE	BASIC PART NO.	SYMBOL
Thermactor Idle Vacuum Valve	**9G328**	

DESCRIPTION

The TIV valve vents the vacuum signal to the atmosphere when the preset manifold vacuum or pressure is exceeded. It is used to divert Thermactor airflow during extended idle conditions to limit exhaust temperature and to cut EGR in a heavy boost mode for turbocharged applications.

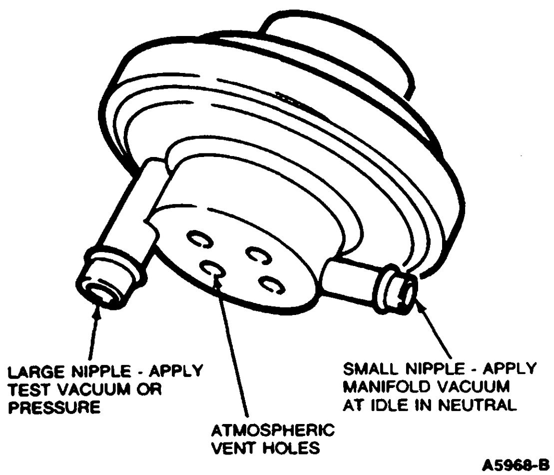


Figure 1 Thermactor Idle Vacuum Valve

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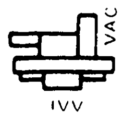
TITLE	BASIC PART NO.	SYMBOL
Thermactor Idle Vacuum Valve	**9G328**	

Functional Checks

TIV valves with code words ASH or RED on decal:

1. With the engine at idle, in NEUTRAL, place fingers over the TIV valve atmospheric vent holes (Figure 1). If no vacuum is sensed, the TIV is damaged and must be replaced.
2. While the engine is still idling in NEUTRAL, apply vacuum, shown below, to the TIV valve large nipple from a test source. If vacuum is still sensed when placing fingers over vent holes, the TIV is damaged and must be replaced.
3. Disconnect the TIV small nipple from manifold vacuum and the TIV large nipple from the test vacuum. Reconnect the TIV valve to original hoses or connectors.

TIV valves with code word TUR on decal:

TIV Decal Code Mode	Vacuum kPa (in. Hg.)
Ash	5.1 (1.5) — 10 (3.0)
Red	11.8 (3.5) — 15.2 (4.5)

TIV Decal Code Mode	Pressure: kPa (in. Hg.)
TUR	5.1 (1.5) — 8.5 (2.5)

1. With the engine at idle, vacuum source to small nipple, transmission in NEUTRAL, place fingers over TIV valve atmospheric vent holes (Figure 1). If vacuum is sensed, the TIV is damaged and must be replaced.
2. While the engine is still idling in NEUTRAL, apply pressure, shown above, to the TIV valve's large nipple from a test source. If vacuum is not sensed when placing a finger over the vent holes, the TIV is damaged and must be replaced.
3. Disconnect the TIV valve's small nipple from manifold vacuum and the large nipple from the test pressure. Reconnect the TIV to its original hoses or connectors.

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TITLE	BASIC PART NO.	SYMBOL
Throttle Position Sensor (Rotary)	**9B989**	

DESCRIPTION

The Throttle Position (TP) Sensor (Rotary) (Figure 1) supplies the ECA with a signal proportional to opening angle of throttle body throttle plates.

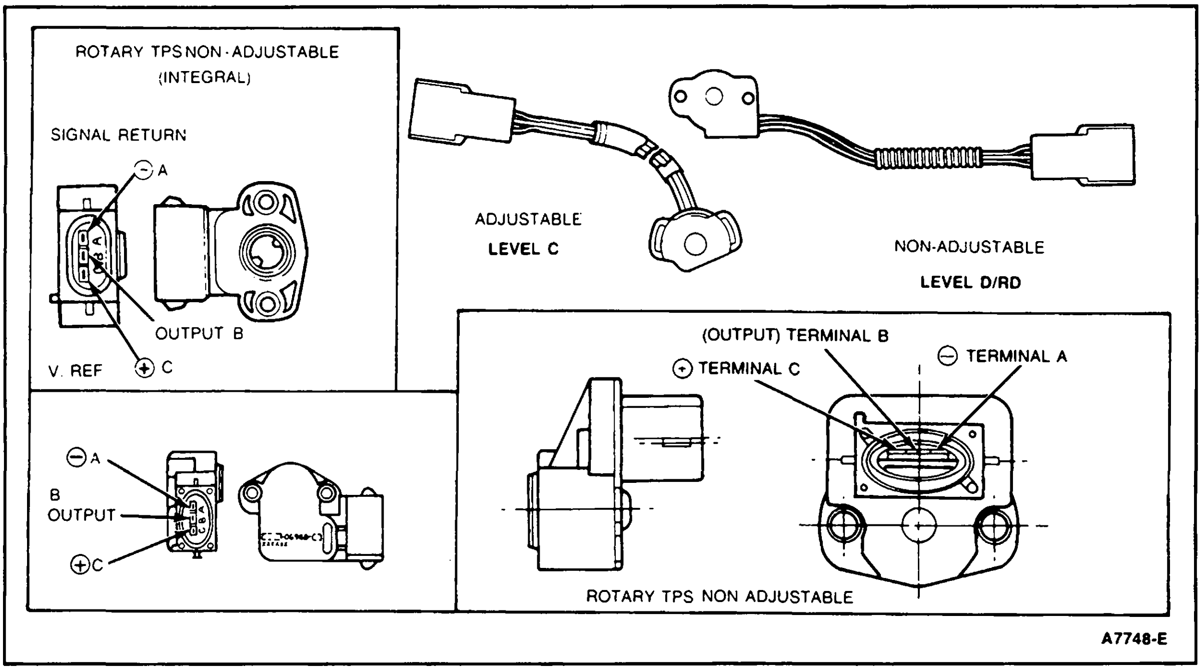

Figure 1 Throttle Position (TP) Sensor (Rotary)

ADJUSTMENT

This procedure can be used to check and/or adjust level C sensors only:

1. Install an EEC-IV Breakout Box, Rotunda T83L-50-EEC-IV, or equivalent.
2. Attach a DVOM, Rotunda 014-00407 or equivalent, on 20 volt scale. Connect the positive lead (+) to test Pin 47 and the negative lead (−) to test Pin 46.
3. Turn ignition key to RUN position, (do not start engine).
4. Adjust TP Sensor (rotate) until the DVOM reads 1.0 volt (0.9-1.1).
5. Tighten TP Sensor screws to 1.2-1.8 N.m (11-16 lb-in).
6. While watching the DVOM, move the throttle to wide-open and back to idle position. For proper operation, the DVOM should move from 1.0 to at least 4.0 and back to 1.0 volt.
7. Perform EEC-IV Quick Test, Section 14.

DIAGNOSIS

Refer to the EEC-IV Quick Test, Section 14.

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TITLE	BASIC PART NO.	SYMBOL
Throttle Solenoid Positioner With Dashpot	9B549 9E957 9D588 9S520 9S553	

DESCRIPTION

The Throttle Solenoid Positioner (TSP) with or without Dashpot combines the features of the throttle solenoid positioner (TSP) and the dashpot by attaching a dashpot to the end of the TSP plunger.

The TSP acts as a variable carburetor throttle stop by extending its plunger when power is supplied to the solenoid and by retracting the plunger when power is turned off. When the TSP is energized, it will hold the throttle at an idle position, but, as soon as it is de-energized at the ignition switch, the TSP will function like an anti-dieseling device by automatically retracting its plunger into an anti-dieseling position, fully closing the throttle.

A TSP may also be used to increase the throttle opening when the air conditioning is turned on.

The dashpot is used on certain applications when a gradual, controlled throttle closing is desired, either for emission purposes or vehicle driveability.

Two kinds of TSPs with a dashpot are used: the fixed plunger rod length type and the adjustable plunger rod length type.

The TSP with a dashpot is not strong enough to open the throttle but will hold it open after it has been mechanically opened.

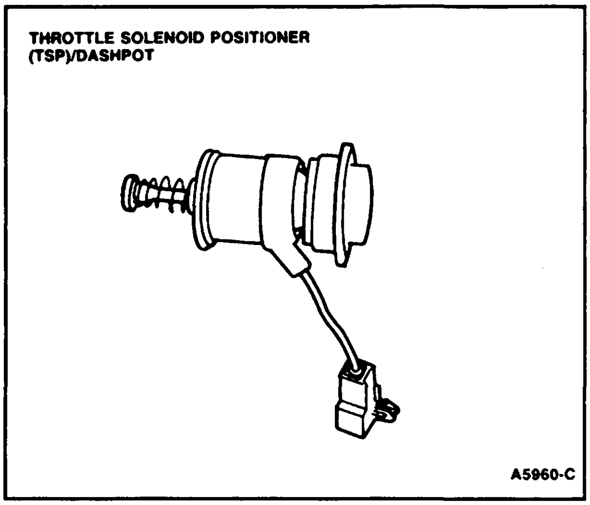

Figure 1 Typical Throttle Solenoid Positioner with Dashpot

DIAGNOSIS

With the throttle open and the solenoid electrically energized, the plunger should extend.

Push the dashpot plunger into the collapsed position, and if no resistance is felt or if excessive force is required to bottom the plunger, the dashpot is damaged.

If either component fails, replace the assembly.

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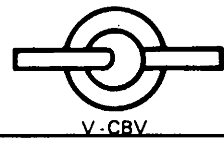
TITLE	BASIC PART NO.	SYMBOL
Vacuum Bowl Vent Valve & Vacuum/Thermostatic Bowl Vent Valve	**9G332**	

DESCRIPTION

The Vacuum Bowl Vent Valve and the Vacuum/Thermostatic Bowl Vent Valve are vacuum and vacuum/temperature actuated On/Off valves.

The Vacuum Bowl Vent Valve (E3TE-9G332-AA) (Figure 2) and the Vacuum Thermostatic Bowl Vent Valve (E3EE-9G332-AA) (Figure 1) are similar in appearance. The valves are used in the Evaporative Emission System to control vapor flow from the carburetor bowl to the carbon canister. With either valve, the flow path from the bowl to the canister is closed by manifold vacuum when the engine is running. The thermostatic valve also closes the bowl-to-canister flow path when the temperature of the valve is 90°F or less (even without manifold vacuum). When the temperature of the valve is 120°F or more, the valve is open (unless closed by manifold vacuum).

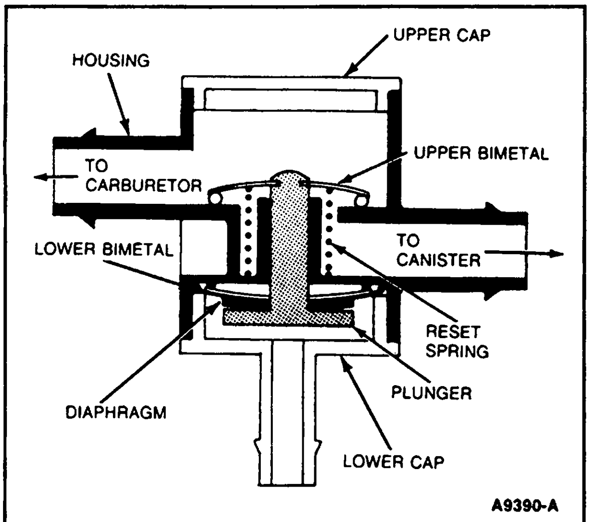


Figure 1 Vacuum/Thermostatic Bowl Vent Valve

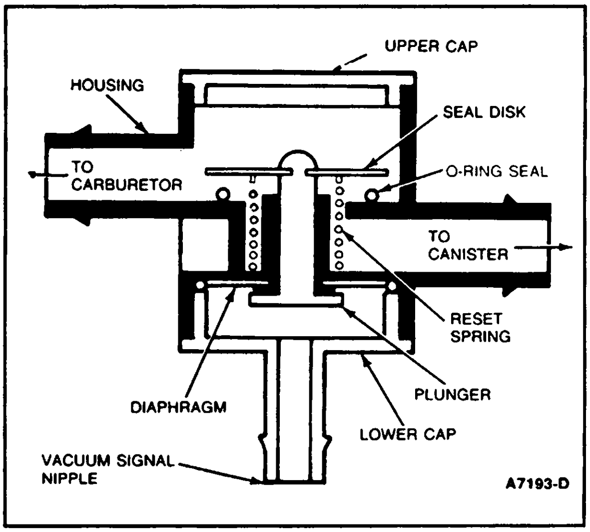


Figure 2 Vacuum Bowl Vent Valve

TESTING

The Vacuum Vent Valve (E3TE-9G332-AA), (Figure 2) should flow air between carburetor port and canister port when no vacuum is applied to vacuum signal nipple and should not flow air with a vacuum applied at the vacuum signal nipple.

The above test also applies to the Vacuum/Thermostatic Vent Valve (E3EE-9G332-AA), (Figure 1) when it is at a temperature of 120°F or more. At a temperature of 90°F or less the valve should not flow air, or be very restrictive to airflow.

The Evaporative Emission System is outlined in Section 7.

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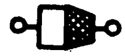
TITLE	BASIC PART NO.	SYMBOL
Vacuum Check Valve	**12A197**	 VCK-V

DESCRIPTION

A vacuum check valve (Figure 1) blocks airflow in one direction. It allows free airflow in the other direction. The check side of this valve will hold the highest vacuum seen on the vacuum side. If not, replace it.

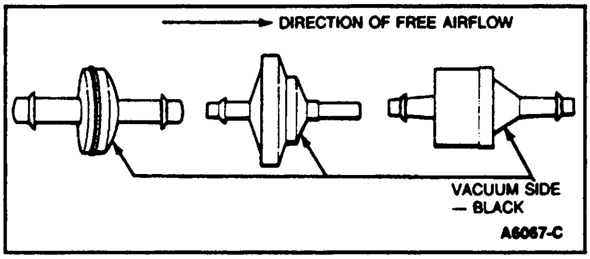


Figure 1 Vacuum Check Valve

DIAGNOSIS

Apply 54 kPa (16 in-Hg) vacuum to "check" side of valve and trap. If vacuum remains above 50.6 kPa (15 in-Hg) for 10 seconds, the valve is acceptable.

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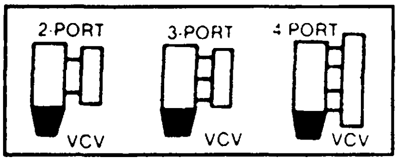
TITLE	BASIC PART NO.	SYMBOL
Vacuum Control Valve	**8A564 9D473 9F454 12A091**	

DESCRIPTION

The VCV controls vacuum to other emission devices during engine warm-up: the 2-port types simply open when engine coolant reaches their pre-determined calibration temperatures; the 4-port types open likewise, since they are nothing more than two 2-port types in one housing; and the 3-port types switch the vacuum source to the center port from the top or the bottom ports. Electrical switches can be either open or closed until the VCV is fully cycled. Most VCV's respond to a sensing bulb immersed in engine coolant by utilizing a wax pellet principle. The only exception is the 9F454 which operates on a bimetal principle. Vacuum is usually sourced as illustrated in Figure 1.

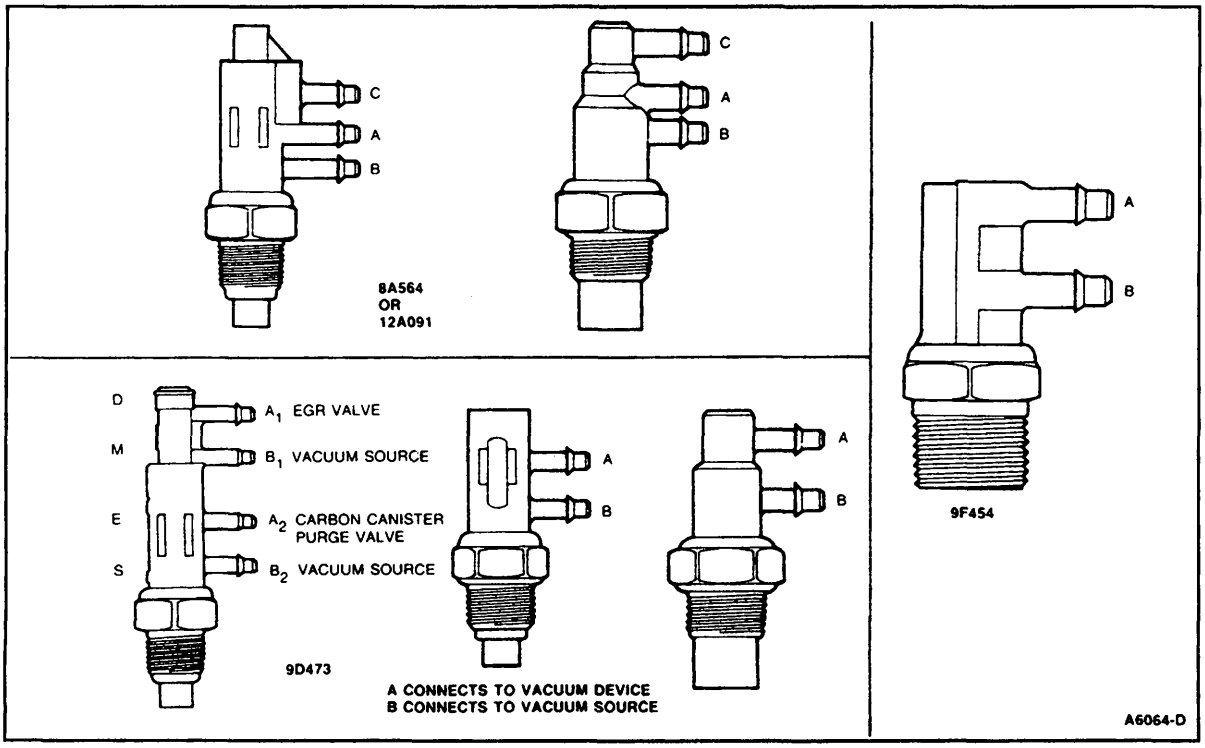


Figure 1 2-, 3-, and 4-Port Vacuum Valves

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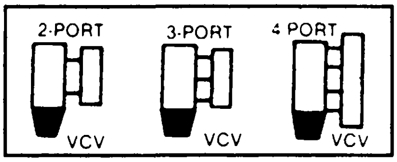
TITLE	BASIC PART NO.	SYMBOL
Vacuum Control Valve	**8A564** **9D473** **9F454** **12A091**	

Functional Vacuum Check

1. With a cold engine, passage A to B should be closed and passage A to C should be open.
2. With engine at normal operating temperature, the VCV should be open between A and B and closed between A and C.

   For the 4-port valve, check A_1 to B_1 and A_2 to B_2 separately.
3. If these conditions are not met, replace the VCV Valve.

Electrical Vacuum Switch

The electrical vacuum switch (Figure 2) could be either opened or closed at room temperature. It will be reversed (opened to closed or closed to opened) with the engine at full operating temperature.

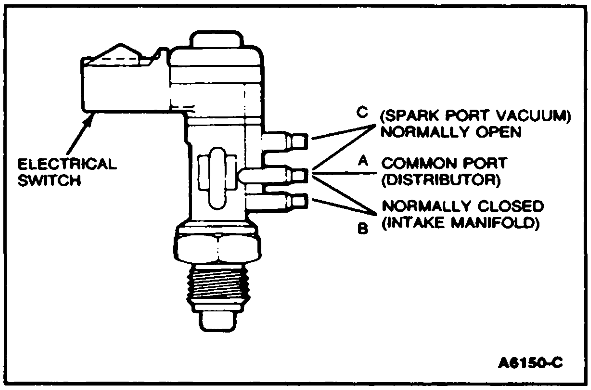


Figure 2 Electrical Vacuum Switch — 8A564

Functional Electrical Check

1. While the engine is cold, measure the continuity across the switch. Compare with specifications.
2. Warm the engine to normal operating temperature.
3. Measure the continuity across the switch. Compare with specifications.
4. The vacuum function is checked as previously described.

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TITLE	BASIC PART NO.	SYMBOL
Vacuum Delay Valves	9E897 12A189 12A208 12A245	VDV DV-TW VRDV

DESCRIPTION

Vacuum Delay Valves (VDV) are used for a gradual application or release of vacuum to a vacuum-operated device to help control emissions. The four valves currently in use are illustrated below with an arrow to show the direction in which airflow is restricted (Figure 1). Note that, although each valve is named for a given system application, it may be used elsewhere.

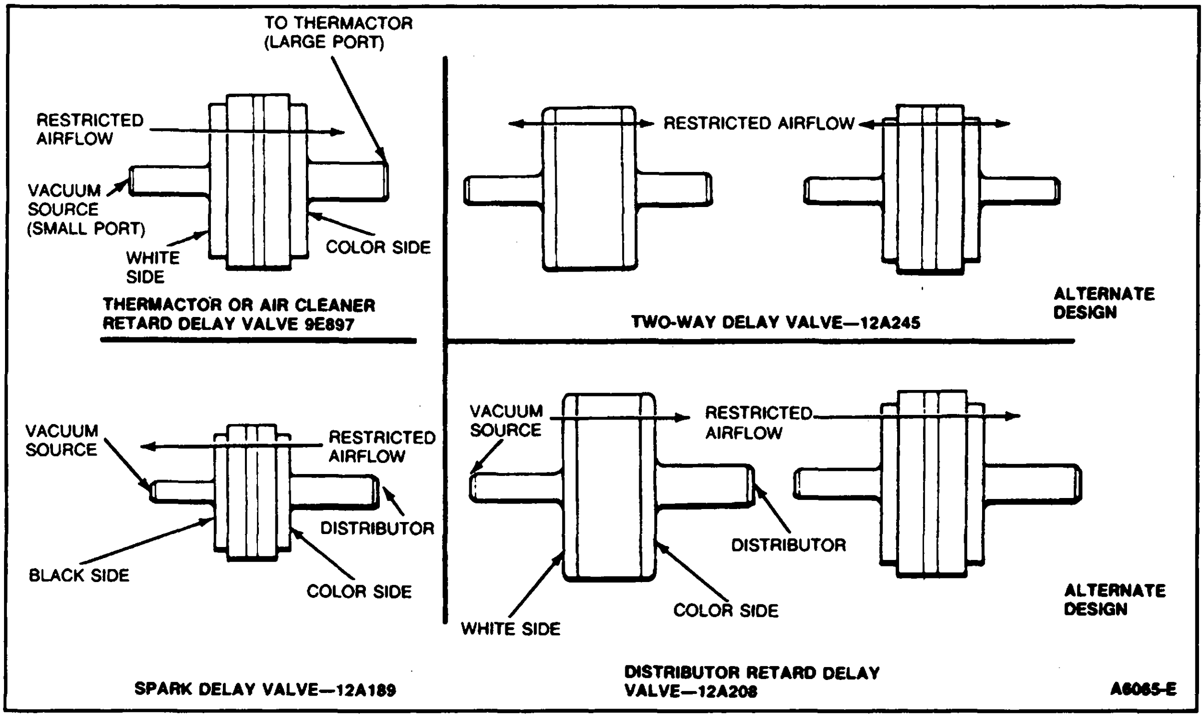

Figure 1 Four Types Of Vacuum Delay Valves

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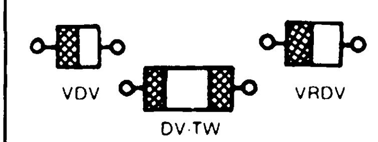
TITLE	BASIC PART NO.	SYMBOL
Vacuum Delay Valves	9E897 12A189 12A208 12A245	

Functional Check

Connect a hand vacuum pump, Rotunda 021-00014 or equivalent, to the VDV as shown in Figure 2 and pump.

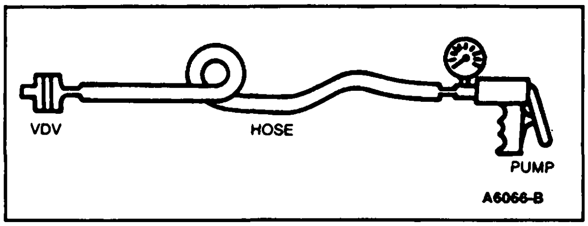


Figure 2 Hand Vacuum Pump Connection

1. Valves with one side black or white and the other side colored are good if vacuum can be built-up in one direction, but not the other direction and if that built-up vacuum can be seen to slowly decrease.
2. Valves with both sides the same color are good if vacuum can be built-up in both directions before visibly decreasing.

NOTE: Exercise care in order to prevent oil or dirt from getting into the valve.

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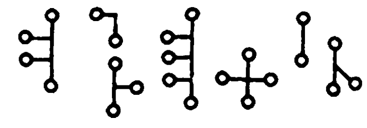
TITLE	BASIC PART NO.	SYMBOL
Vacuum Harness Assembly — Nylon	**9E498**	

DESCRIPTION

Engine vacuum systems currently use a preassembled harness which features colored nylon vacuum lines. The color is a visual aid both in production and in service. The emission decal on the engine provides a colored schematic of the vacuum hook-up which corresponds with the preassembled harness.

Vacuum hose harnesses consist of nylon hoses; 0.150-inch outer diameter and 0.090-inch inner diameter bonded to nylon or rubber connectors. Occasionally, a rubber hose may be connected to the harness. The nylon connectors have rubber inserts to provide a seal between the nylon connector and the component connection (nipple).

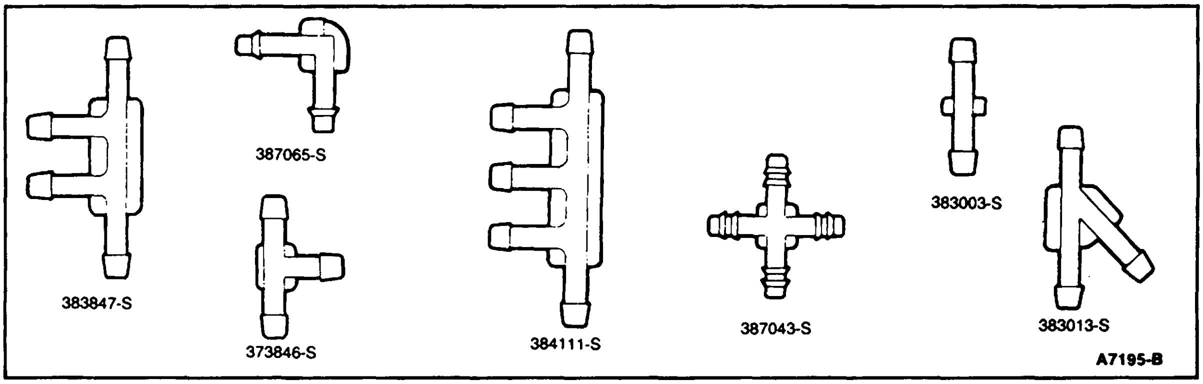


Figure 1 Vacuum Connectors Used With 5/32 Inch Rubber Hose for Service

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TITLE	BASIC PART NO.	SYMBOL
Vacuum Harness Assembly — Nylon	**9E498**	

SERVICE PROCEDURES

If a nylon tube is broken or kinked, and the damaged area is 1/2-inch or more from a connector; the tube can be repaired by cutting out the damaged section, but not more than 1/2-inch, and then installing a rubber union (Figure 2).

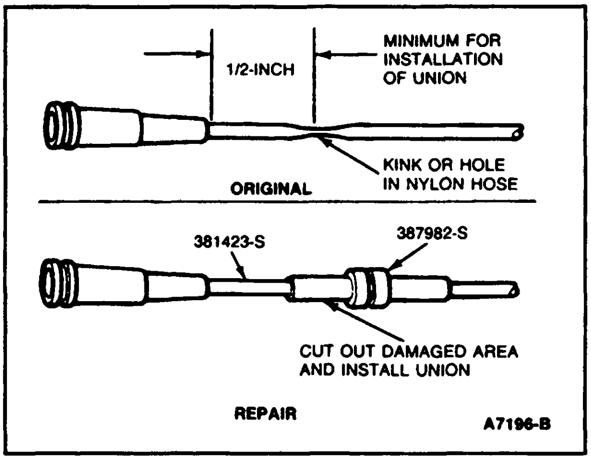

Figure 2 Broken or Kinked Hose Repair

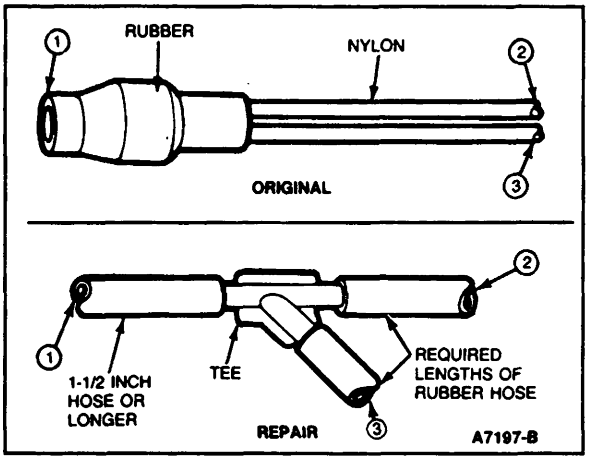

Figure 3 Hose Replacement

If the remaining hose is too short or the damaged portion is more than 1/2-inch: replace the entire hose and connectors with rubber vacuum hoses and a tee. Use existing service stock of 5/32-inch hose, 7/32-inch hose and tees.

NOTE: Circled numbers shown in Figure 3, identify same connection points on both original and repaired harnesses.

CAUTION

Care must be exercised to keep all vacuum parts away from hot components such as EGR tubes and exhaust manifolds. In addition, holes may be worn into the nylon hoses if allowed to rub against rough surfaces.

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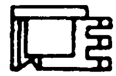
TITLE	BASIC PART NO.	SYMBOL
Vacuum Regulator (2-Port)	**9F490**	

DESCRIPTION

The two port vacuum regulator (Figure 1) provides a constant output signal when the input signal is greater than a preset level. At a lower input vacuum, the output equals the input.

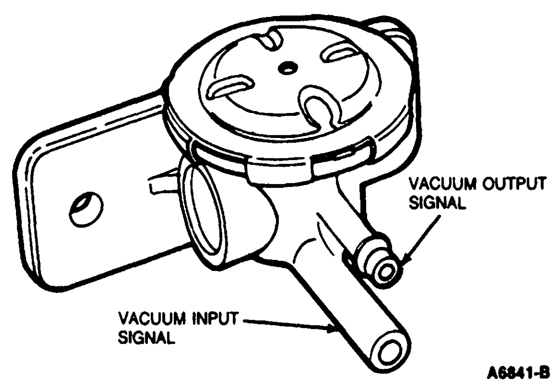


Figure 1 2-Port Vacuum Regulator

Functional Check

1. Remove vacuum line from the barbed output port (Figure 1), and install Rotunda Vacuum Gauge 059-00008 or equivalent.
2. With manifold vacuum at the input port and the engine at idle, the vacuum gauge should read between 35.7-45.9 kPa (10.5-13.5 in-Hg).
3. If the vacuum gauge reading is not within the specification, replace the regulator as required.

NOTE: The two port vacuum regulator is commonly attached to a 90-cubic inch vacuum reservoir.

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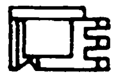
TITLE	BASIC PART NO.	SYMBOL
Vacuum Regulator (3 & 4 Port)	**9F490**	 VRV

DESCRIPTION

The three-port and four-port regulators are used to control the vacuum advance to the distributor. During engine idle conditions, the manifold vacuum signal is reduced to a constant output signal. Off idle, the output signal equals the spark port.

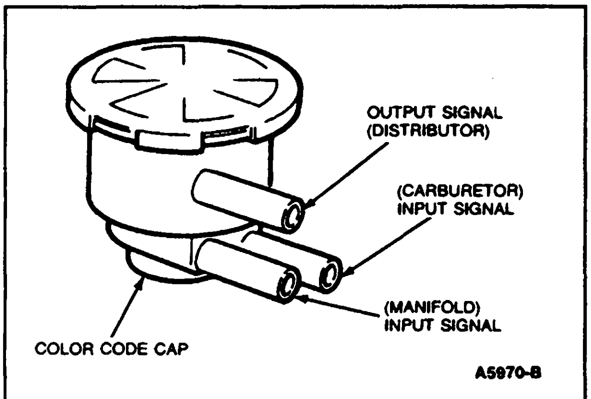


Figure 1 3-Port Vacuum Regulator

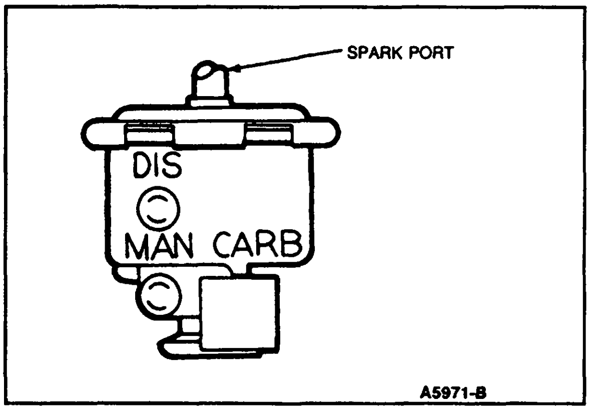


Figure 2 4-Port Vacuum Regulator

Functional Check

1. Remove the vacuum line from distributor port, and install a vacuum gauge (Figures 1 and 2).
2. With the engine at idle, the vacuum gauge reading should be within 3.4 kPa (1 in-Hg) vacuum of calibration point.
3. With the color codes different, vacuum readings are identified:
   - Black is 20 kPa (6 in-Hg)
   - Green is 23.6 kPa (7 in-Hg)
   - Red is 27 kPa (8 in-Hg)

   If the color code does not meet the respective vacuum reading, replace as required.

   NOTE: This procedure is applicable to both types of vacuum regulators.

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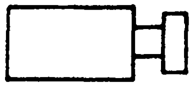
TITLE	BASIC PART NO.	SYMBOL
Vacuum Reservoir	**9E453**	 VRESER  VRESER

DESCRIPTION

The Vacuum Reservoir (Figure 1) stores vacuum and provides "muscle" vacuum. It prevents rapid fluctuations or sudden drops in a vacuum signal such as those seen during an acceleration period.

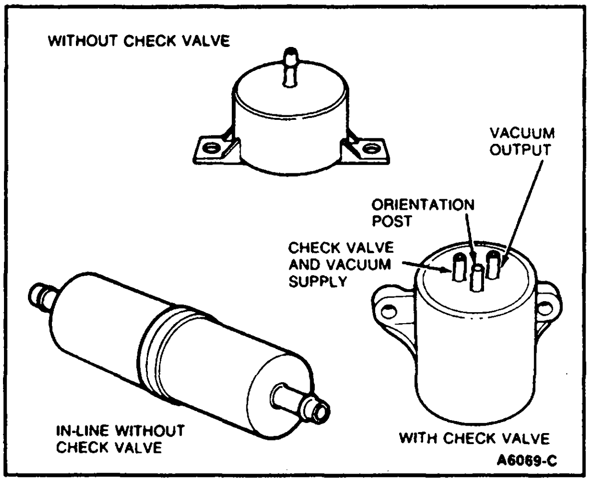


Figure 1 Vacuum Reservoirs

DIAGNOSIS

When charged initially with 15 to 20 in-Hg vacuum, vacuum loss shall not exceed .5 in-Hg in 60 seconds. If it does, replace the reservoir.

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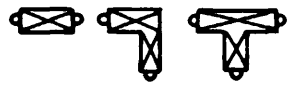
TITLE	BASIC PART NO.	SYMBOL
Vacuum Restrictor	**12A225** **9K319**	

DESCRIPTION

This orifice-type flow restrictor (Figure 1) is used in several emission calibrations to control the flow rate and/or timing inactions to the following emission component systems:

a. EGR valve timing — opening and closing

b. Part throttle spark advance

c. Purge system

d. Thermactor system

RESTRICTOR HOLE SIZE	COLOR
.015 IN.	BLUE
.020 IN.	RED
.024 IN.	ORANGE
.030 IN.	YELLOW
.060 IN.	GREEN

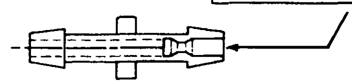


Figure 1 Distributor Vacuum Restrictor

DIAGNOSIS

The flow rate through the restrictor is the same in both directions. If it is blocked, replace it.

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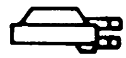
TITLE	BASIC PART NO.	SYMBOL
Vacuum Vent Valve	**12A226**	 VACVV-D

DESCRIPTION

The Vacuum Vent Valve (Figure 1) controls the induction of fresh air into a vacuum system to prevent chemical decay of the vacuum diaphragm that can occur on contact with fuel. The 12A226 (natural cap) is a combined vent and delay valve. Although this valve was intended for use in a specific system with an air cleaner mounting, it may be used in any other vacuum system and mounted elsewhere. The valve should be mounted, as shown, with ports pointing downward for fuel drainback. The vacuum source must be connected to the cap port and the system or device operated, to the body port, as shown.

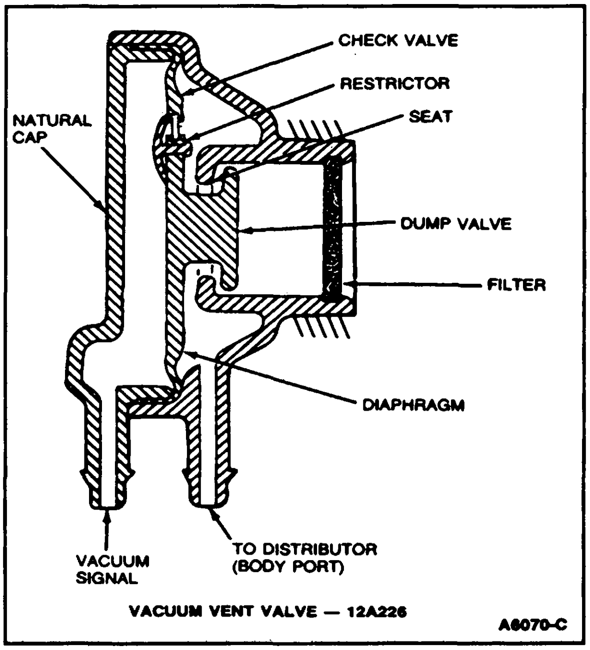


Figure 1 Vacuum Vent Valves — 12A226

DIAGNOSIS

1. With no vacuum applied to the signal port, the distributor (body port) should be open to atmosphere.
2. With an applied vacuum, the distributor should be closed to atmosphere.
3. A vacuum applied to the signal port and trapped should bleed off when the distributor port is open.

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TITLE	BASIC PART NO.	SYMBOL
Vane Airflow Meter	**12B529**	

DESCRIPTION

The Vane Airflow Meter (Figure 1) measures air flowing into the engine and is mounted between the air cleaner and the air throttle body assembly. The meter contains a movable vane directly connected to an electrical device known as potentiometer. Air, rushing through the vane airflow meter, changes the position of the vane and the potentiometer. The potentiometer relays vane position information to the EEC-IV module. The EEC-IV module can then translate vane position information into the volume of air flowing into the engine.

Inside the vane airflow meter is an air temperature sensor. This sensor constantly monitors the temperature of the air flowing into the engine. This information is also transmitted to the EEC-IV module.

The EEC-IV module computes volumetric airflow and air temperature, then adjusts the fuel flow to obtain the optimum air/fuel mixture.

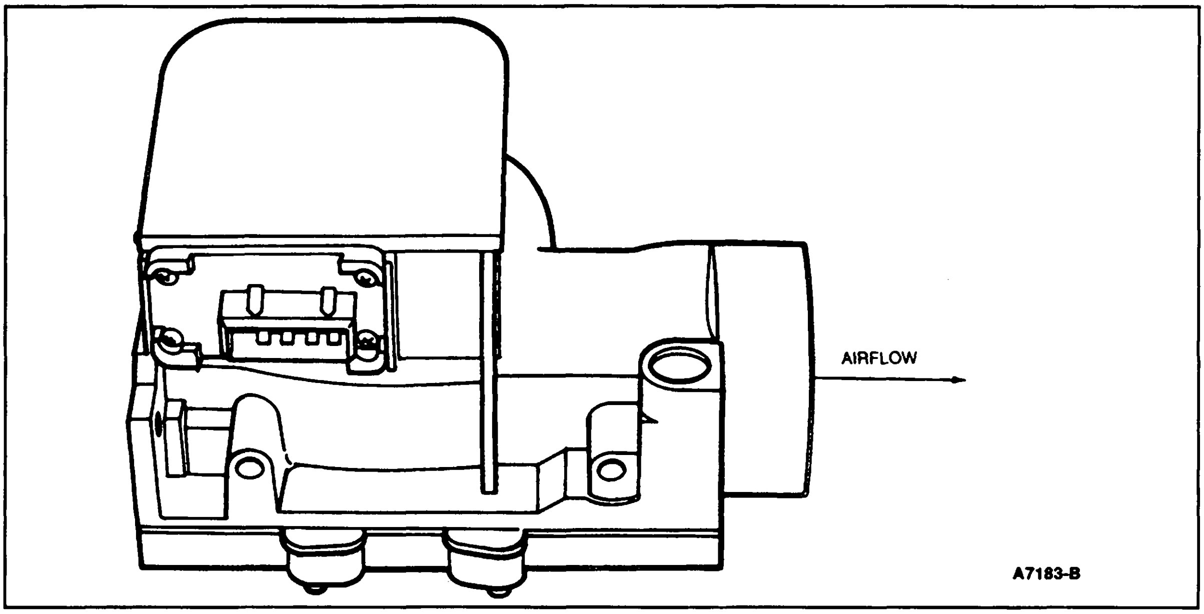

Figure 1 Vane Airflow Meter

DIAGNOSIS

1. Use the 1983-87 Car/Powertrain Lubrication Maintenance Manual, Volume D, and the 1985-87 Merkur Shop Manual for the vane meter removal procedure.
2. After removing the vane meter, spray carburetor cleaner on a clean cloth and pass the cloth through the meter to remove oil film buildup. Do not spray inside vane meter.
3. Reinstall the vane meter.
4. Rerun Quick Test. Refer to Section 14.
5. If code is still present, replace vane meter, Rerun Quick Test.

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SECTION 4

Carburetors, Throttle Bodies and Injectors

Contents

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Cranks Normally But Slow to Start Hard Start Hot/Cold	4-3 & 4-7
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Pre-checks

- Verify battery is fully charged.
- Verify adequate fuel supply in the fuel tank.
- Verify fuse/fuse link integrity.
- Inertia switch set.
- Inspect the fuel lines and fuel tank for deformaties, leaks and kinks.
- Inspect the vacuum lines for leaks — disconnected, kinks, or broken plastic connector.
- Inspect the cooling system to be sure it is filled and free of leakage.
- Inspect the cooling hoses to be sure they are not collapsed, kinked, or leaking.
- Inspect ignition system for crossfire, spark plug wires — coil wire off or loose.
- Inspect ignition system for breakage or other damage.
- Verify ignition timing.

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CFI, EFI & Carburetor System Troubleshooting

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
o No Start — Cold	• Carburetor	• No fuel in carburetor bowl.	• Check by actuating accelerator pump. If no fuel discharge is seen, check fuel delivery system. Refer to Group 24 or Section 11.
		• Cold enrichment or choke system not functioning.	• Check linkage for proper operation and adjustment clean, service, or replace as required.
		• Venturi valve sticking open, **7200 only.**	• Clean and service as required.
		• Clogged air bleeds or idle passages.	• Clean with solvent and compressed air.
	• CFI-EFI	• Inoperative ISC motor.	• Go to EEC-IV Diagnostics.
		• TP sensor stuck at WOT	• Crank engine with TP sensor disconnected.
		• Plugged, leaking, or inoperative injector. • Fuel pressure failure.	• CFI only — Check for fuel discharge at the injector. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure in this Section.
		• Throttle body ISC-BPA contaminated.	• Clean throttle body and ISC-BPA. Refer to Group 24.
		• Throttle plate stop screw backed out.	• Go to adjustment procedure in this Section.
			Return to Routine 201, Section 2.

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CFI, EFI & Carburetor System Troubleshooting

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Hard Start — Cold	• Carburetor	• Cold enrichment or choke system not functioning.	• Check linkage for proper operation and adjustment; clean, service or replace as required.
		• Incorrect choke thermostat adjustment, lean or rich.	• Adjust choke. If tamperproof, check for correct assembly.
		• Venturi valve sticking open, **7200 only.**	• Clean and service as required.
		• Accelerator pump not functioning, check visually for fuel discharge.	• Visually check for fuel discharge and service as required.
		• Leaking intake manifold or carburetor gaskets.	• Replace leaking gaskets.
		• Feedback motor inoperative, **7200 only.**	• Clean and service as required. Refer to Section 3.
	• CFI-EFI	• ISC inoperative.	• Go to EEC-IV Diagnostics.
		• Plugged, leaking, or inoperative injector.	• CFI only — Check for fuel discharge at the injector. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure in this Section.
		• Throttle body, ISC-BPA contaminated.	• Clean throttle body and ISC-BPA. Refer to Group 24.
		• Throttle plate stop screw backed out.	• Go to adjustment procedure in this Section.
			Return to Routine 203, Section 2.

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CFI, EFI & Carburetor System Troubleshooting

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Rough Idle — Cold, Emission Test Failure	• Carburetor	• Cold enrichment or choke system not functioning.	• Check linkage for proper operation and adjustment; clean, service, or replace as required. Check choke pull down adjustment. Check voltage to choke cap.
		• Improper idle adjustment.	• Perform idle adjustments.
		• Improper fast idle adjustments.	• Perform fast idle adjustments.
		• Venturi valve sticking open, **7200 only.**	• Clean and service as required.
		• Venturi valve diaphragm leaking, **7200 only.**	• Check and service as required.
		• Feedback motor inoperative, **7200 only.**	• Check and service as required. Refer to Section 3.
		• Metering rod bent, **7200 only.**	• Check and service as required. Refer to Group 24.
		• Air cleaner duct vacuum motor damaged, open to cold air source always.	• Service or replace as required. Refer to Section 3.
		• Improper idle mixture.	• Perform propane check, adjust if out of specification.
	• CFI-EFI	• Plugged, leaking or inoperative injector.	• CFI only — Check for fuel discharge at the injector. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure in this Section.
			Return to Routine 204, Section 2.

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CFI, EFI & Carburetor System Troubleshooting

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Stall, Stumble, Hesitation — Cold	• Carburetor	• Cold enrichment or choke system not functioning.	• Check linkage for proper operation and adjustment; clean, service or replace as required. Check choke pulldown. Check voltage to choke cap.
		• Accelerator pump not functioning, check visually for fuel discharge.	• Visually check for fuel discharge and service as required.
		• Low fuel pump delivery.	• Test fuel pump, service or replace as required. Refer to Group 24 or Section 11.
		• Feedback motor malfunction, **7200 only.**	• Check and service as required. Refer to Section 3.
		• Clogged fuel filter.	• Clean or replace as required. Find cause.
		• Power valve stuck closed.	• Replace power valve.
		• Improper or obstructed main jets.	• Check, clean, or replace as required. For 7200, replace carburetor.
		• Air cleaner duct vacuum motor damaged open to cold air source.	• Service or replace as required. Refer to Section 3.
		• Venturi Valve Diaphragm failure, **7200 only.**	• Replace diaphragm.
	• CFI-EFI	• TP sensor failure.	• Go to EEC-IV Diagnostics.
		• Plugged, leaking, or inoperative injectors.	• CFI only — Check for fuel discharge at the injector. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure in this Section.
		• Throttle body ISC-BPA contaminated.	• Clean throttle body and ISC-BPA. Refer to Group 24.
		• Throttle plate stop screw backed out.	• Go to adjustment procedure in this Section.
			Return to Routine 202 or 207, Section 2.

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CFI, EFI & Carburetor System Troubleshooting

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• No Start — Hot	• Carburetor	• No fuel in carburetor bowl.	• Check by actuating accelerator pump. If no fuel discharge is seen, check fuel delivery system. Refer to Group 24 or Section 11.
		• Cold enrichment or choke system not functioning.	• Check linkage for proper operation and adjustment; clean, service, or replace as required.
		• Venturi valve sticking, **7200 only.**	• Clean and service as required.
		• Flooding or loading.	• Check float level, adjust as required.
	• CFI-EFI	• Inoperative ISC motor. • TP sensor stuck at WOT.	• Go to EEC-IV Diagnostics.
		• Plugged, leaking, or inoperative injector. • Fuel pressure failure.	• CFI only — Check for fuel discharge while cranking engine. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure in this Section.
			Return to Routine 201, Section 2.

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CFI, EFI & Carburetor System Troubleshooting

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Hard Start, Hot	• Carburetor	• Cold enrichment or choke system not functioning.	• Check linkage for proper operation and adjustment; clean, service, or replace as required.
		• Incorrect choke, thermostat adjustment, lean or rich.	• Adjust thermostat housing and choke cap. If tamperproof, check for correct assembly.
		• Venturi valve sticking open, **7200 only.**	• Clean and service as required.
		• Bowl vents plugged.	• Check internal vent for adjustment and external vent for kinked hose.
		• Feedback motor inoperative, **7200 only.**	• Check and service as required. Refer to Section 3.
		• Flooding or loading.	• Check float level, service as required.
		• Leaking intake manifold or carburetor gaskets.	• Replace leaking gaskets.
	• CFI-EFI	• Excessive fuel pressure.	• Clean, service or replace — — Fuel return line. — Fuel pressure regulator. Refer to Section 11.
		• Contaminated fuel pressure regulator valve and seat.	• Clean, service or replace fuel pressure regulator. • Check fuel pressure bleed down after engine has been turned off.
		• Plugged, leaking, or inoperative injector. • Injector O-ring seal leaking.	• CFI only — Check for fuel discharge at the injector. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure in this Section.
		• ISC inoperative.	• Go to EEC-IV Diagnostics.
			Return to Routine 203, Section 2.

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CFI, EFI & Carburetor System Troubleshooting

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Rough Idle — Hot Emission Test Failure	• Carburetor	• Cold enrichment or choke system not functioning.	• Check linkage for proper operation and adjustment; clean, service, or replace as required.
		• Venturi valve sticking, **7200 only.**	• Clean and service as required.
		• Improper idle adjustments.	• Perform all idle adjustments.
		• Throttle plates sticking.	• Check and service as required.
		• Choke pulldown diaphragm not functioning.	• Check and service as required.
		• Venturi valve diaphragm leaking, **7200 only.**	• Check and service as required.
		• Improper idle mixture.	• Perform propane check, adjust if out of specification.
		• Clogged air bleeds or air passages.	• Clean with solvent and compressed air.
		• Improper fuel level.	• Adjust float level.
		• Feedback motor, **7200 only.**	• Check for smooth operation. Refer to Section 3.
	• CFI-EFI	• Plugged, leaking or inoperative injector. • Injector O-ring seal leaking.	• CFI only — Check for fuel discharge at the injector. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure in this Section.
		• Throttle body ISC-BPA contaminated.	• Clean throttle body and ISC-BPA. Refer to Group 24.
			Return to Routine 204, Section 2.

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CFI, EFI & Carburetor System Troubleshooting

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Stall, Stumble, Hesitation — Hot	• Carburetor	• Cold enrichment or choke system not functioning.	• Check linkage for proper operation and adjustment; clean, service, or replace as required.
		• Inoperative accelerator pump.	• Visually check for pump shot or fuel siphoning. Service as required.
		• Low fuel pump volume.	• Test pump; fuel delivery system. Refer to Group 24 or Section 11.
		• Feedback motor malfunctioning, **7200 only.**	• Check and service as required. Refer to Section 3.
		• Bowl vents plugged.	• Check internal vent adjustments, external for kinked hoses.
		• Clogged fuel filter.	• Check and replace as required. Check cause.
		• Power valve stuck closed.	• Replace valve.
		• Improper or obstructed main jets.	• Check, clean or replace as required. **For 7200, replace carburetor.**
		• Venturi Valve Diaphragm failure, **7200 only.**	• Replace diaphragm.
		• Carburetor Feedback System Malfunction.	• Refer to appropriate MCU or EEC Diagnostic procedure.
	• CFI-EFI	• TP Sensor Malfunction.	• Go to to EEC-IV Diagnostics.
		• Plugged, leaking, or inoperative injector.	• CFI only — Check for fuel discharge at the injector. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure in this Section.
		• Throttle body ISC-BPA contaminated.	• Clean throttle body and ISC-BPA. Refer to Group 24.
			Return to Routine 202 or 207, Section 2.

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CFI, EFI & Carburetor System Troubleshooting

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Low Idle Speed, Stalls on Decel or Quick Stop	• Carburetor	• Idle speed adjustment.	• Check and adjust as required.
		• Throttle positioner/Dashpot not functioning.	• Check and service as required.
		• Venturi valve sticking, **7200 only.**	• Check and service as required.
		• Feedback motor malfunctioning, **7200 only.**	• Check and service as required. Refer to Section 3.
		• Clogged air bleeds or idle passages.	• Remove and clean with solvent and compressed air.
		• Venturi Valve diaphragm leaks, **7200 only.**	• Replace diaphragm.
		• Leaking intake manifold or carburetor gaskets.	• Replace leaking gaskets.
	• CFI-EFI	• ISC inoperative. • TP Sensor malfunction.	• Go to EEC-IV Diagnostics.
		• Base idle adjustment.	• Go to adjustment procedure.
			Return to Routine 206, Section 2.

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CFI, EFI & Carburetor System Troubleshooting

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Lack of Power	• Carburetor	• Sticking venturi valve or leaking diaphragm, **7200 only.**	• Check, clean and service as required.
		• Venturi valve limiter out of adjustment, **7200 only.**	• Adjust as required.
		• Accelerator pump not functioning or improper adjustment. Check visually for fuel discharge.	• Check and service as required.
		• Control vacuum regulator off specification (high), **7200 only.**	• Check and adjust as required.
		• Plugged pump discharge nozzle.	• Clean nozzle with compressed air.
		• Leaking fuel at pump discharge nozzle screw gasket.	• Replace gasket.
		• Improper float setting.	• Adjust float level.
		• Main metering system plugged, contaminated fuel.	• Clean fuel system as required.
		• Venturi Valve Diaphragm failure, **7200 only.**	• Replace diaphragm.
		• Feedback motor, **7200 only.**	• Check for smooth operation. Refer to Section 3.
		• Fuel filter or fuel delivery lines restricted.	• Check fuel delivery. Refer to Group 24 or Section 11.
		• Carburetor feedback system malfunction.	• Refer to appropriate MCU or EEC Diagnostic procedure.
		• Secondary throttle plates stuck closed.	• Check and service as required. Refer to Group 24.
	• CFI-EFI	• TP sensor malfunction	• Go to EEC-IV Diagnostics.
		• Plugged, leaking, or inoperative injectors. • Fuel pressure regulator failure.	• CFI only — Check for fuel discharge at the injector. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure in this Section.
			Return to Routine 209, Section 2.

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CFI, EFI & Carburetor System Troubleshooting

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Poor Mileage	• Carburetor	• Feedback motor malfunction, **7200 only.**	• Check and service as required. Refer to Section 3.
		• Carburetor feedback system malfunction.	• Refer to appropriate MCU Diagnostic Procedure.
		• Cold enrichment, or choke system malfunctioning.	• Check choke system function and adjustment.
		• Purge vent control valve malfunctioning.	• Check evaporative control valve and evaporative system. Refer to Section 7.
	• CFI-EFI	• Injector O-ring seal leaking	• Perform injector leakage test.
			Return to Routines 213, 219, Section 2.

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CFI, EFI & Carburetor System Troubleshooting

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Reduced Top Speed/Power	• Carburetor	• Venturi valve sticking, **7200 only.**	• Check, clean and service as required.
		• Incorrect venturi WOT opening, **7200 only.**	• Adjust as required.
		• Binding throttle linkage.	• Clean and service as required.
		• Venturi valve diaphragm leaking, **7200 only.**	• Check and service as required.
		• Low fuel pump volume.	• Test fuel delivery system. Refer to Group 24, or Section 11.
		• Metering rods bent, **7200 only.**	• Service as required.
		• Incorrect float drop.	• Adjust as required.
		• Clogged fuel filter.	• Replace as required. Check cause.
		• Power valve stuck closed.	• Replace power valve.
		• Improper or obstructed main jets.	• Clean or replace as required. **For 7200, replace carburetor.**
		• Inoperative secondary system on two-staged carburetors.	• Check shaft and plate alignment, binding linkage, service as required.
		• Feedback motor inoperative.	• Check for smooth operation. Refer to Section 3.
		• Carburetor feedback system malfunction.	• Refer to appropriate MCU Diagnostic procedure.
	• CFI-EFI	• Plugged, leaking, or inoperative injectors. • Fuel pressure failure.	• CFI only — Check for fuel discharge at injector. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure in this Section.
		• TP Sensor malfunction.	• Go to EEC-IV Diagnostics.
			Return to Routine 209, Section 2.

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CFI, EFI & Carburetor System Troubleshooting

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Surge at Cruise	• Carburetor	• Restricted fuel delivery or fuel filter.	• Replace filter. Refer to Section 11.
		• Improper fuel level.	• Adjust float level and drop, check float hinge pin for binding; service and adjust as required.
		• Low fuel pump volume or pressure.	• Test fuel delivery system. Refer to Group 24 or Section 11.
		• Contaminated fuel.	• Drain fuel, clean as required.
		• Damaged metering rods, **7200 only.**	• Replace.
		• Feedback motor inoperative.	• Check for smooth operation. Refer to Section 3.
		• Blocked air bleeds.	• Clean and service as required.
		• Fuel leaks around carburetor.	• Service as required.
	• CFI-EFI	• Plugged or leaking fuel injectors.	• CFI only — Check for fuel discharge at the injector. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure in this Section.
			Return to Routine 210, Section 2.

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Flooding, Black Exhaust Smoke, Gas Smell	• Carburetor	• Float problem.	• Service as required. Refer to Group 24.
		• Damaged fuel inlet or sticking needle.	• Service as required.
		• Excessive fuel pressure.	• Check fuel pressure. • Service fuel return line. Refer to Section 11.
	• CFI-EFI	• Excessive fuel pressure. • Injector stuck open, or O-ring seal leaking.	• CFI only — Check for fuel discharge at the injector. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure in this Section.

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CFI, EFI & Carburetor System Troubleshooting

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• High Idle Speed Engine Diesels or Idles too Fast	• Carburetor	• Not coming off fast idle cam.	• Check linkage for proper operation and adjustment; clean, service, or replace as required.
	• Carburetor CFI-EFI	• Incorrect idle base adjustment.	• Perform all idle adjustments. Go to adjustment procedures in this Section.
		• Vacuum leaks.	• Check all vacuum lines and connections.
		• Sticking throttle plate or linkage.	• Visual check for proper operation.
			Return to Routine 211, Section 2.

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Idle Speed Setting Procedure

Note

The curb idle and fast idle speeds are controlled by the EEC-IV processor and the idle speed control device and cannot be adjusted.

Remember

A change in idle speed occurred because of a problem elsewhere. You should only enter this procedure after you have eliminated the possible causes listed below:

- Contamination within the throttle bore
- Contamination within the idle speed control device
- Throttle sticking or binding
- Engine not reaching operating temperature
- Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable, etc.)

Verify

- Transmission in PARK or NEUTRAL
- Parking brakes applied (automatic brake release disconnected where applicable)
- Wheels blocked
- Cooling system filled
- Engine at operating temperature
- Heater and accessories off
- Throttle lever is resting on the throttle plate stop screw (EFI only)
- Ignition timing set to specification

a. Perform EEC-IV diagnostics and resolve any vehicle malfunction that are indicated by service output codes. (Ignore this step if you were sent here from an EEC-IV Pinpoint Test Step).

b. Engine off, disconnect the negative (-) terminal of the battery for three minutes minimum then reconnect it. (Omit this step if you are required to do it in Step 8 for Truck).

c. Start engine and stabilize for two minutes, then goose engine and let it return to idle, lightly depress and release the accelerator and let engine idle. Does engine idle properly?

NOTE: If electric cooling fan comes on, wait until it turns off.

d. If engine does not idle properly, SHUT ENGINE OFF. Go to the appropriate adjustment procedure page. Follow the procedure from top of the page in sequence to the bottom of the page.

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Idle Speed Setting Procedure

CFI ENGINES

1. Engine off, remove air cleaner. Connect jumper wire between self-test input (STI) and signal return pin on the self test connector (Figure 1).
2. Turn ignition key on but do not start engine. ISC plunger will retract within 10-15 seconds. If ISC plunger does not retract, perform EEC-IV diagnostics.
3. Disconnect vehicle harness from the ISC motor. Turn ignition key off and remove jumper wire.
4. Start engine, check idle rpm. If it is not:

   1.9L: 600 + 50 rpm continue with Step 9.

   2.5L: ATX 50 rpm less than specified on Decal continue with Steps 5, 6, 7 and 8.

   2.5L: MTX 100 rpm less than specified on Decal continue with Steps 5, 6, 7 and 8.
5. Turn ignition key off. Remove CFI assembly from vehicle.
6. Remove the plug that covers the throttle stop adjusting screw (Figure 3).
7. Remove the old throttle stop adjusting screw and install a new screw.
8. Install the CFI assembly. Start engine and let it stabilize.
9. Adjust throttle stop adjusting screw (Figure 2 or 3). Refer to Step 4 for idle rpm.
10. Shut engine off and reconnect vehicle harness to the ISC motor. Reinstall air cleaner.

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Idle Speed Setting Procedures

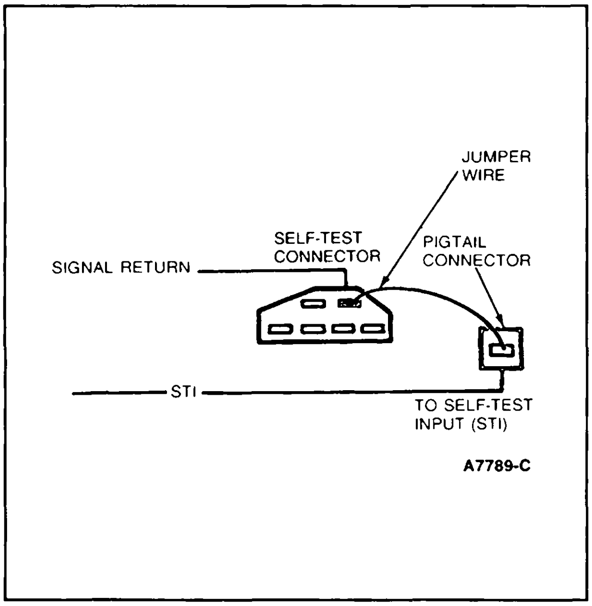

Figure 1 1.9L CFI and 2.5L CFI HSC

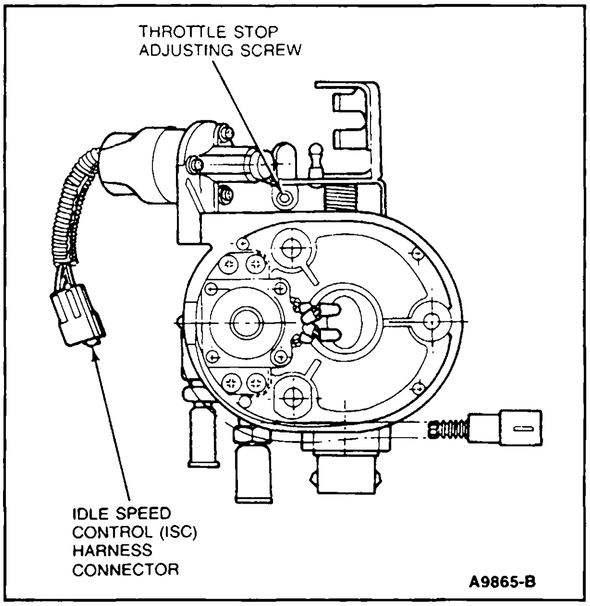

Figure 2 1.9L CFI

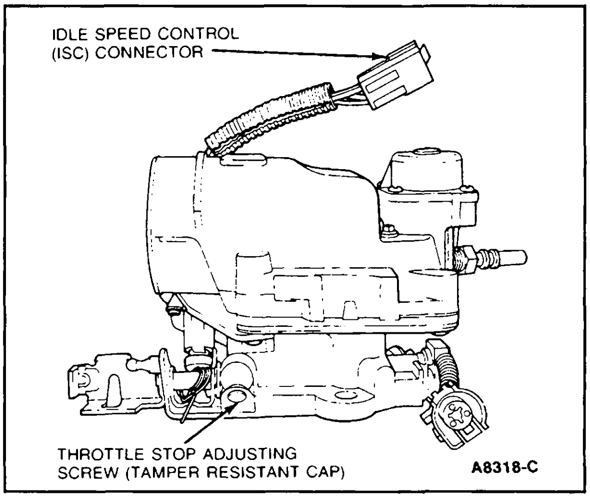

Figure 3 2.5L CFI HSC

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Idle Speed Setting Procedures

ADJUSTMENT PROCEDURE FOR PASSENGER CAR	1.9L EFI HO	2.3L EFI HSC	2.3L EFI OHC	2.3L EFI TURBO	3.0L EFI AXOD	3.0L SEFI MA	3.8L SEFI RWD	3.8L SEFI MA/SC	3.8L SEFI AXOD	5.0L SEFI
REFER TO FIGURE —	4	5	6	6	7	8	9	10	9	11
1. Unplug spout line and verify that ignition timing is Base ±2 degrees BTDC.		X			X	X				
2. Remove PCV hose from throttle body and plug it. Remove CANP hose from throttle body and connect it to the PCV connector of the throttle body.						X X				
3. Remove PCV hose at the PCV valve and install .200 inch diameter orifice (Tool T86P-9600-A).		X			X					
4. Disconnect Idle Speed Control-Air Bypass Solenoid.	X	X	X	X	X	X				
5. Start engine and run at: rpm/sec	2000/60	2500/30	1500/20	2000/120	2000/30					
6. Place automatic transmission in manual transmission in Neutral	Park	Drive	Park	Park	Drive	Neutral	Park	Park	Park	Park
7. Engine off, back out throttle plate stop screw clear off the throttle lever pad.							X	X	X	X
8. With a .010in. feeler gauge between the throttle plate stop screw and the throttle lever pad turn the screw in until contact is made then turn it an additional							1.5 turns	1.5 turns	1.5 turns	1, 2
9. Check/adjust idle rpm: Turn the throttle plate stop screw to (rpm)	950 ± 50	1025±50 1550±50	A 650±25 M 600±25	750 ± 50	760 ± 20	800 ± 30				
Adjustment must be completed within (seconds) See NOTE below. Shut engine off and repeat Steps 5, 6, 9.	120									
10. Shut engine off and disconnect battery for 3 minutes minimum.					X	X				X
11. Engine off reconnect spout line.		X			X					
12. Remove CANP hose from PCV connector of throttle body and reconnect it to its CANP fitting. Unplug PCV hose and reconnect it to its PCV fitting.						X X				
13. Remove orifice from PCV hose and reconnect to PCV valve.		X			X					
14. Engine off reconnect idle speed control-air bypass solenoid verify the throttle is not stuck in the bore and linkage not preventing throttle from closing.	X	X	X	X	X	X				
15. Start engine and stabilize for 2 minutes then goose engine and let it return to idle, lightly depress and release the accelerator let engine idle	X	X	X	X	X	X	X	X	X	X
	If idle problem still exists, Go To Section 2 for other possible causes.									
16. On Automatic Overdrive Transmission (AOD) applications or Automatic Transaxle (AXOD) application check TV adjustment.					X		X		X	X

<u>**NOTE For Step 9:**</u> **After the time frame idle speed may change due to strategy parameter.**

1 1 1/2 turns 5.0L HI Output Engine
2 1 7/8 turns 5.0L base Engine

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Idle Speed Setting Procedures

ADJUSTMENT PROCEDURE FOR TRUCK	2.3L EFI OHC	2.9L EFI	3.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.5L EFI
REFER TO FIGURE —	6	12	7	13	13	13	14
1. With engine off install specified feeler gauge between throttle plate stop screw and throttle lever.				.050 in.	A .050 in. M .030 in.	A .030 in. M .030 in.	
2. Unplug spout line and verify that ignition timing is base ±2 degrees BTDC.				X	X	X	
3. Disconnect idle speed control-air bypass solenoid.	X	X	X	X	X	X	X
4. With transmission in Neutral or Park:	X	X	X	X	X	X	X
• Run engine at: rpm/sec	2500/30	2500/30	2500/30				2500/30
• Let engine idle for 2 minutes				X	X	X	
5. Place automatic transmission in .... manual transmission in Neutral.	Park	Park	Drive	Park	Park	Park	Park
6. Check/adjust idle rpm: Turn the throttle plate stop screw to (rpm)	575±25	725	A 625±25 M 725±25	3 650+25 4 750+25	A 675+50 M 700+50	C6 780+50 E4OD 730+50 MAN 730+50	C6 650+50 E4OD 650+50 MAN 650+25
				See Note Below			
7. Shut engine off and repeat Steps 4, 5, and 6.		X	X				
8. Shut engine off and disconnect battery for 3 minutes minimum.		X	X	X	X		
9. Remove feeler gauge from throttle plate stop screw and throttle lever pad.				X	X	X	
10. Reconnect spout line.				X	X	X	
11. Engine off reconnect idle speed control-air bypass solenoid, verify the throttle is not stuck in the bore and linkage not preventing throttle from closing.	X	X	X	X	X	X	X
12. Start engine and stabilize for 2 minutes then goose engine and let it return to idle, lightly depress and release the accelerator	X	X	A 700±50 M 800±50	X	X	X	X
				See Note Below			
let engine idle	If idle problem still exists, Go To Section 2 for other possible causes.						
13. On Automatic Overdrive Transmission (AOD) applications check TV pressure adjustment.				X	X		

NOTE: For Step 6, if you must turn the throttle stop screw in, shut engine off, make estimated adjustment. Start engine and repeat Steps 4, 5, and 6 before continuing.

3 4.9L Calibrations: 7-52ER —, 7-52JR —, 7-52KR —, 7-52MR —, 7-52QR —, 7-52RR —, 7-52ZR —, 7-72JR —.
4 All other 4.9L Calibrations.

NOTE: For Step 12, a condition may occur where the engine rpm will oscillate. This can be caused by the throttle plates being open enough to allow purge flow. To verify this condition, disconnect the carbon canister purge line and plug it. If purge is present, the throttle plates must be closed until the purge flow induced idle oscillations stop.

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Idle Speed Setting Procedures

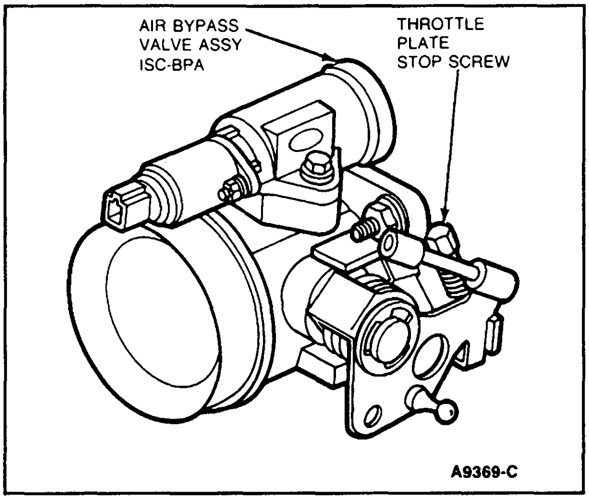

Figure 4 1.9L EFI HO

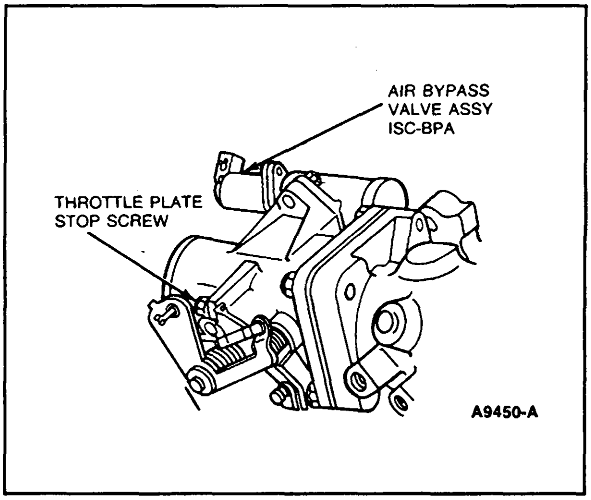

Figure 6 2.3L EFI OHC Car (Truck) and 2.3L EFI Turbo

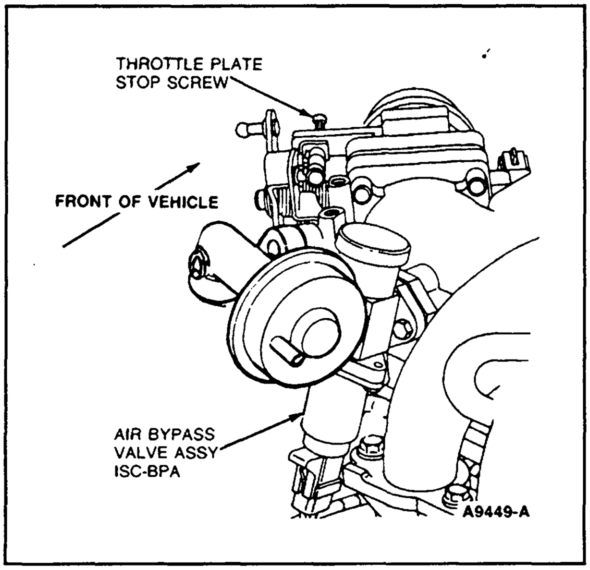

Figure 5 2.3L EFI HSC

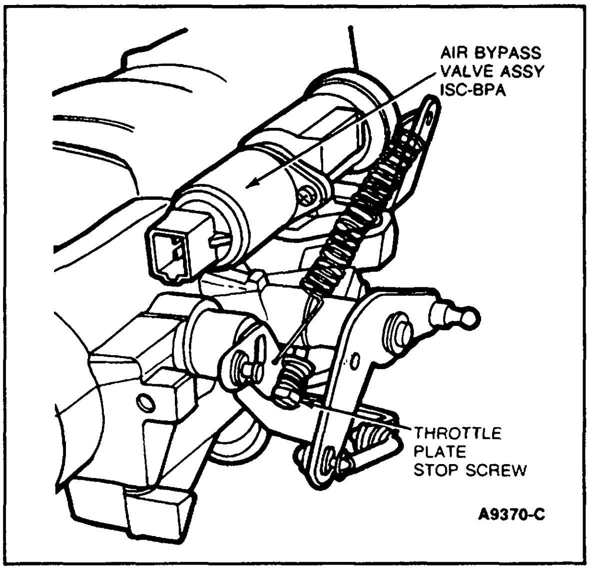

Figure 7 3.0L EFI

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Idle Speed Setting Procedures

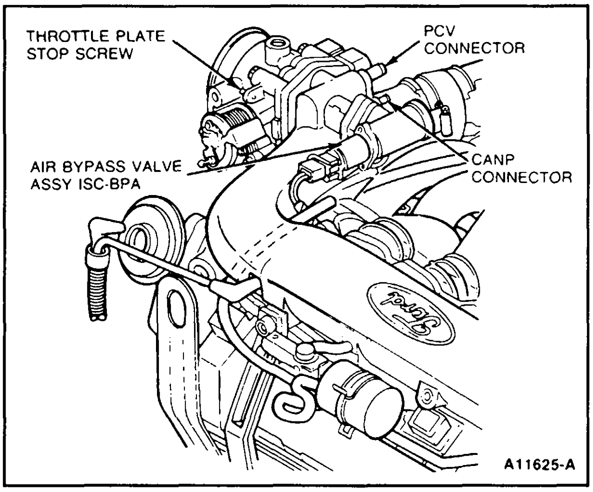

Figure 8 3.0L SEFI MA

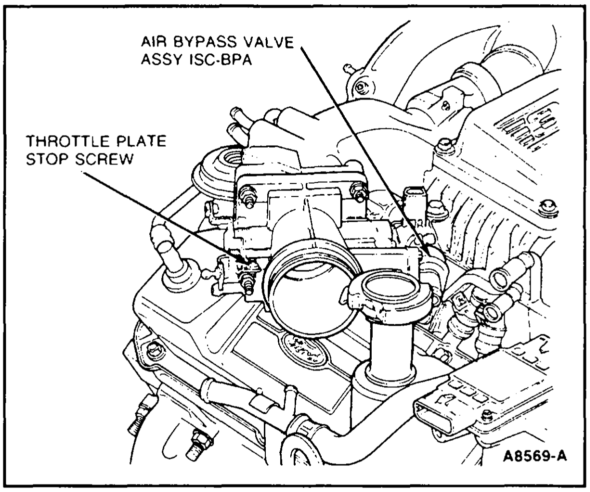

Figure 10 3.8L SEFI MA/SC

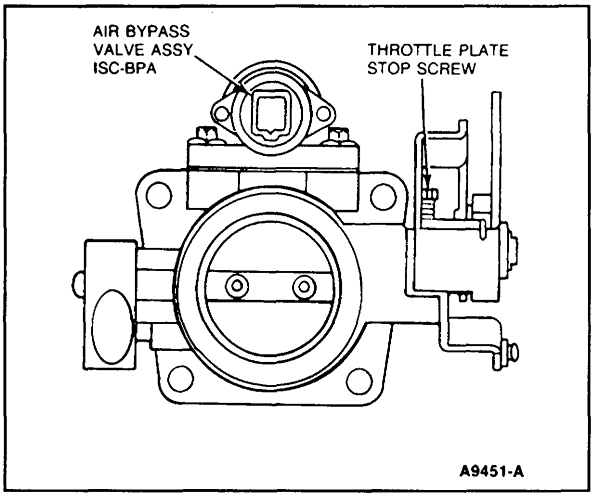

Figure 9 3.8L EFI AXOD/RWD

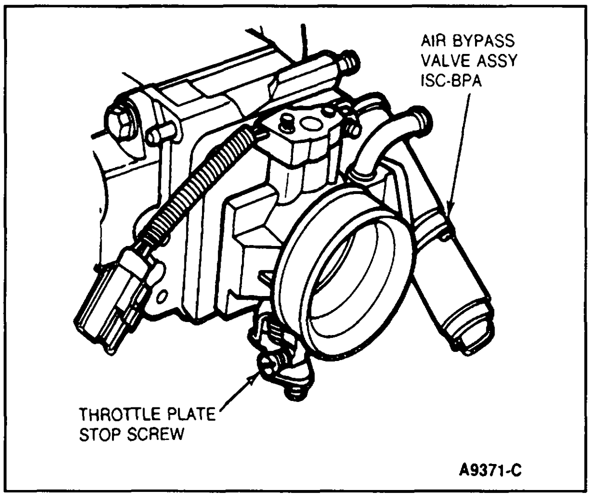

Figure 11 5.0L SEFI

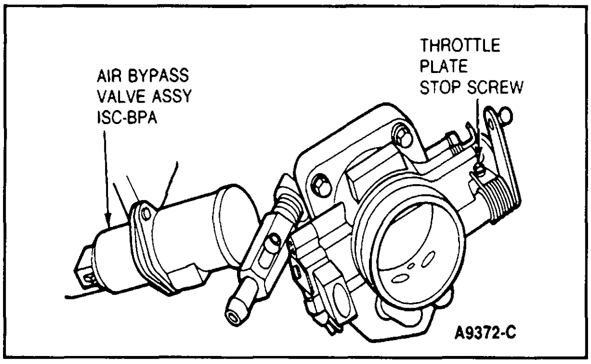

Figure 12 2.9L EFI

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Idle Speed Setting Procedures

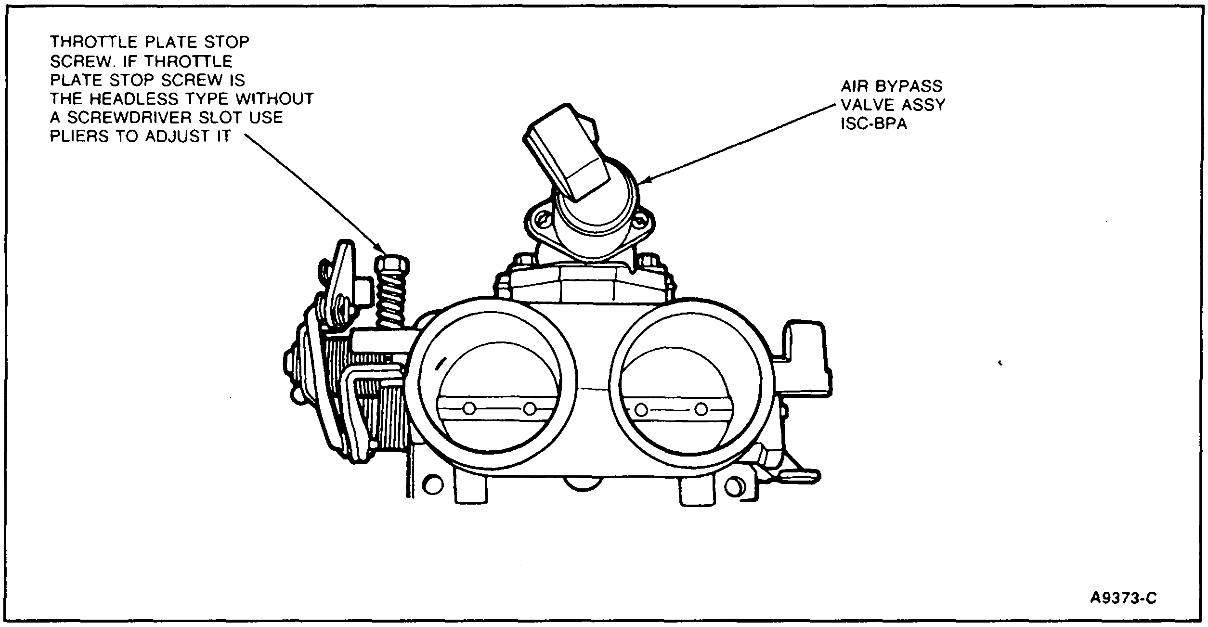

Figure 13 4.9L, 5.0L and 5.8L EFI

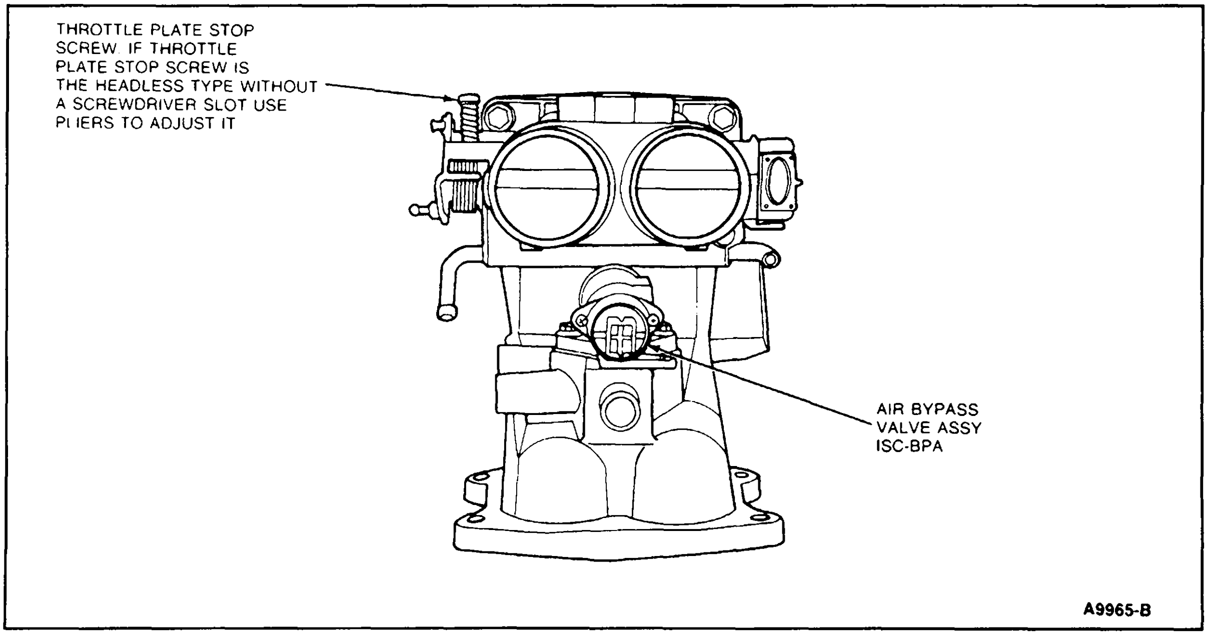

Figure 14 7.5L EFI

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Idle Speed Setting Procedures

PASSENGER CAR

5.8L (W) Engine w/7200-VV — Fast Idle RPM

Instructions

1. Place the transmission in NEUTRAL or PARK. Set parking brake and block wheels. If equipped with automatic brake release, disconnect vacuum hose and plug it.
2. Bring engine to normal operating temperature.
3. Place A/C-Heat Selector to the OFF position.
4. Disconnect the vacuum hose at the EGR valve and plug.
5. Place the fast idle adjustment on the second step of the fast idle cam (Figure 1). Check/ adjust fast idle rpm to specification.
6. Rev engine momentarily, place fast idle adjustment on the specified step and recheck fast idle rpm.
7. Remove plug from EGR vacuum hose and reconnect.

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Idle Speed Setting Procedures

PASSENGER CAR

5.8L (W) Engine w/7200-VV — Curb Idle RPM

Instructions

1. Place the transmission in NEUTRAL or PARK. Set parking brake and block wheels. If equipped with automatic brake release, disconnect the vacuum hose and plug it.
2. Bring the engine to normal operating temperature.
3. Place A/C-Heat selector to the OFF position.
4. Disconnect and plug the vacuum hose at the throttle kicker.
5. Place the transmission in specified position.
6. Check/adjust curb idle rpm, if adjustment is required.
   - Adjust the curb idle speed screw (Figure 2).
7. Place the transmission in NEUTRAL or PARK. Rev the engine momentarily. Place the transmission in specified position, and recheck curb idle rpm and readjust only if required.
8. Apply a slight pressure on top of the nylon nut located on the accelerator pump to take up the linkage clearance.
9. Turn the nylon nut on the accelerator pump rod clockwise until a .010 ± .005 clearance is obtained between the top of the accelerator pump and the pump lever.
10. Turn the accelerator pump rod one turn counterclockwise to set the lever lash preload.
11. Remove the plug from the throttle kicker vacuum hose and reconnect.

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Idle Speed Setting Procedures

PASSENGER CAR

5.8L (W) Engine w/7200-VV — Kicker Speed Set

Instructions

1. Place the transmission in NEUTRAL or PARK. Set parking brake and block wheels. If equipped with automatic brake release, disconnect the vacuum hose and plug it.
2. Bring engine to normal operating temperature.
3. Place the A/C-Heat selector in the OFF position.
4. Disconnect and plug the vacuum hose at the VOTM kicker.
5. Connect an external vacuum source providing a minimum of 33.7 kPa (10 in-Hg) to the VOTM kicker.
6. Place the transmission selector in the specified position.
7. Check/adjust VOTM kicker speed. If adjustment is required, loosen the saddle bracket hold-down screw, then turn the VOTM kicker speed adjusting screw. After adjustment is made, tighten the saddle bracket hold-down screw (Figure 2).
8. Remove external vacuum source. Remove plug from VOTM kicker hose and reconnect.

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Idle Speed Setting Procedures

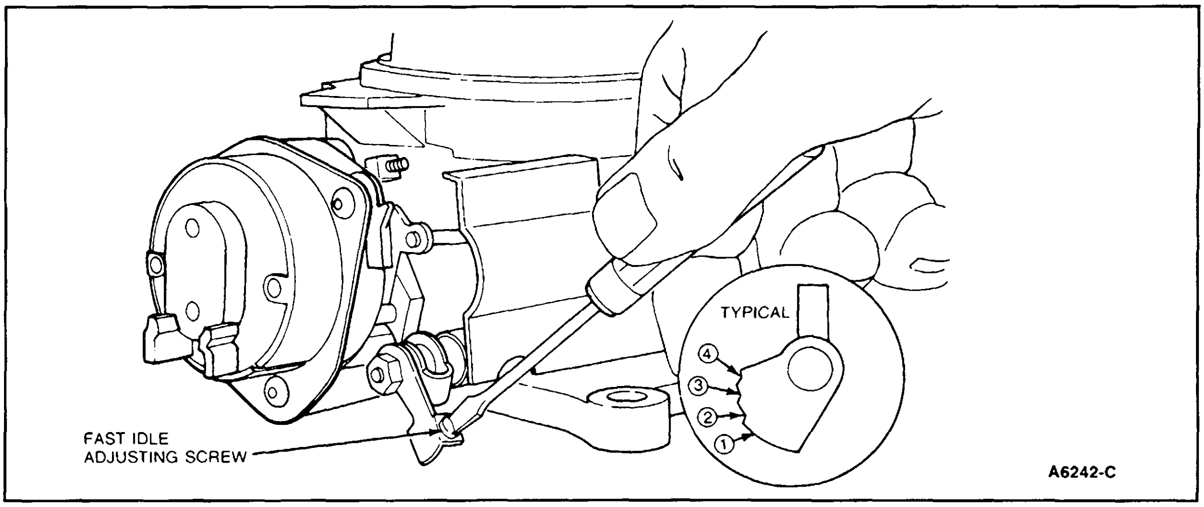

Figure 1 5.8L w/7200-VV Carburetor — Fast Idle RPM Adjustment

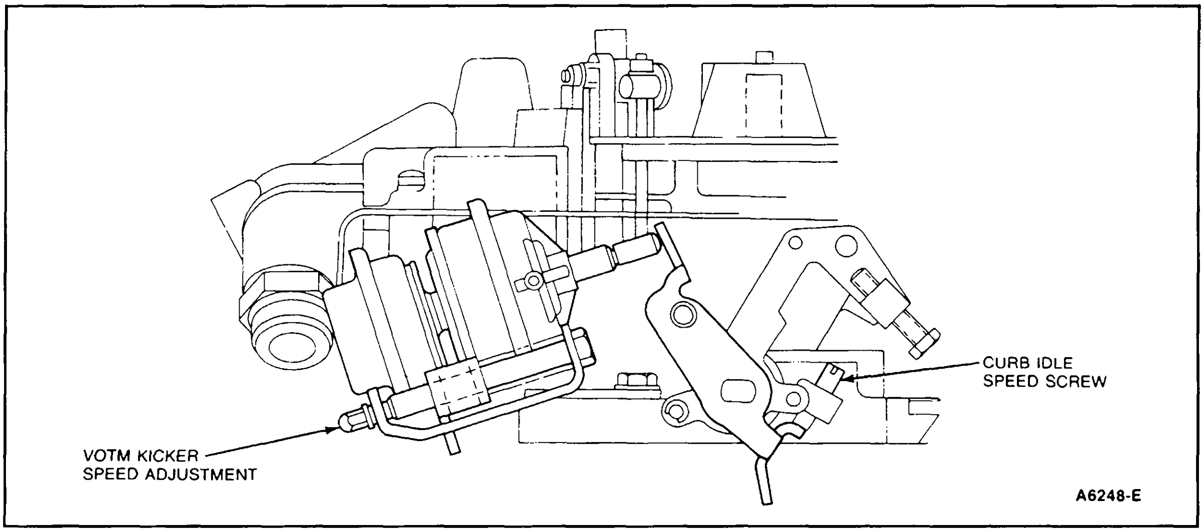

Figure 2 5.8L w/7200-VV Carburetor and VOTM (Kicker) Dashpot

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Idle Speed Setting Procedures

TRUCK, OVER 8500 GVW

6.1L & 7.0L Engines — Fast Idle RPM

Instructions	6.1L 2380EG-2V	7.0L 4190EG-4V
1. Stabilize engine temperature.	X	X
2. Place the vehicle in PARK or NEUTRAL, A/C in OFF position, and set parking brake.	X	X
3. Remove air cleaner.	X	X
4. Disconnect and plug evaporative emission purge valve hose.	X	X
5. Disconnect and plug EGR valve vacuum hose.	X	X
6. Bypass vacuum retard delay valve in distributor advance line with vacuum hose.	X	X
7. Depress accelerator pedal fully, pull choke control to full choke and release accelerator pedal.	X	X
8. Check/adjust choke plate pulldown clearance.		
a. Move the choke operating lever to the first detent, Figure	1	5
b. Measure the choke plate pulldown clearance using a size	.200 in	.234 in
drill. Place the drill between the air horn wall and lower edge of the choke plate.		
c. Adjust the clearance if necessary by bending the choke link, Figure	1	3
9. Check/adjust fast idle rpm. Insert a 0.375-inch gauge between choke plate and air horn in the down-stream side of the choke plate. Adjust fast idle rpm by turning fast idle adjusting screw, Figure	1	4
10. Remove the plug from the EGR vacuum hose and reconnect.	X	X
11. Remove bypass hose and reinstall the vacuum retard delay valve.	X	X
12. Remove the plug from the evaporative emission purge valve hose and reconnect.	X	X
13. Reinstall air cleaner.	X	X

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Idle Speed Setting Procedures

TRUCK, OVER 8500 GVW

6.1L & 7.0L Engines — Curb Idle Speed Decel Throttle Control Speed and Anti-Dieseling Set Speed

Instructions	6.1L 2380EG-2V	7.0L 4190EG-4V
1. Stabilize engine temperature.	X	X
2. Place the transmission in PARK or NEUTRAL, A/C in OFF position, and set parking brake.	X	X
3. Disconnect shed system hose and hot and cold air supply from air cleaner.	X	X
4. Remove air cleaner.	X	X
5. Adjust curb idle, if necessary, using the curb idle adjusting screw with transmission in NEUTRAL for manual and in DRIVE for automatic. Refer to Figure	1	2
6. Rev the engine momentarily, recheck curb idle and adjust if necessary.	X	X
7. With solo-pot collapsed (de-energized), set the anti-dieseling speed if necessary by adjusting the screw until specified rpm is attained. Refer to Figure	1	2
8. Reinstall the air cleaner.	X	X
9. Reinstall shed system hose and hot and cold air supply systems.	X	X

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Idle Speed Setting Procedures

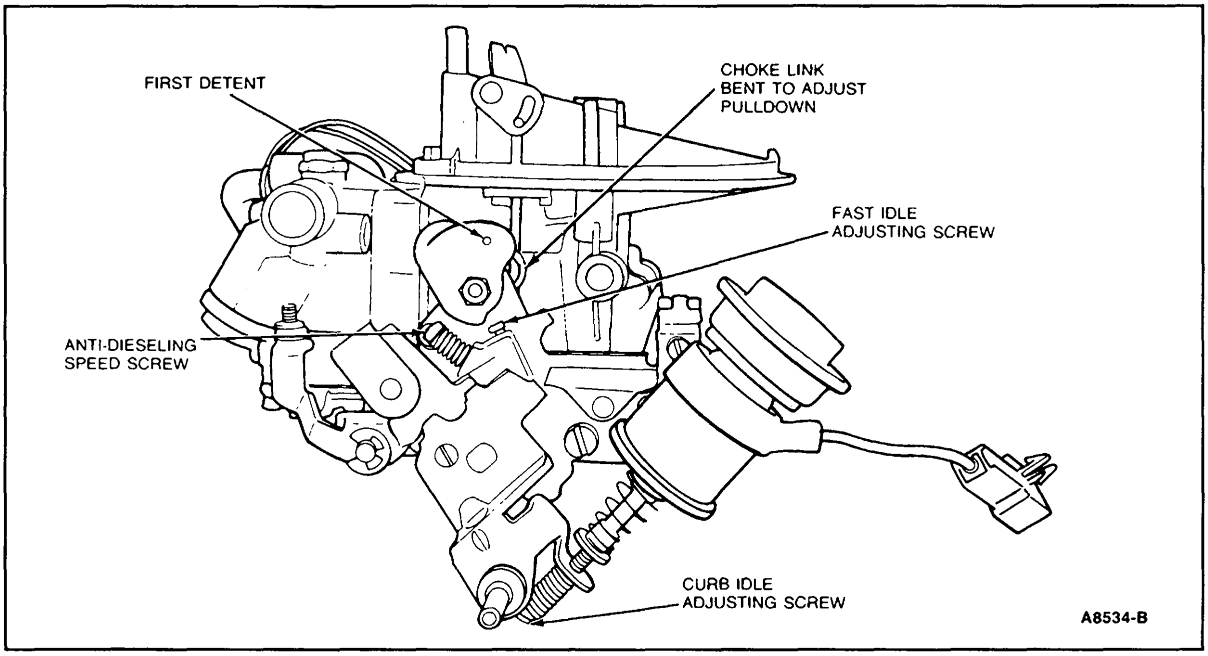

Figure 1 6.1L Engine with 2380 EG 2V-Curb Idle, Anti-Dieseling and Fast Idle Speed Adjustments

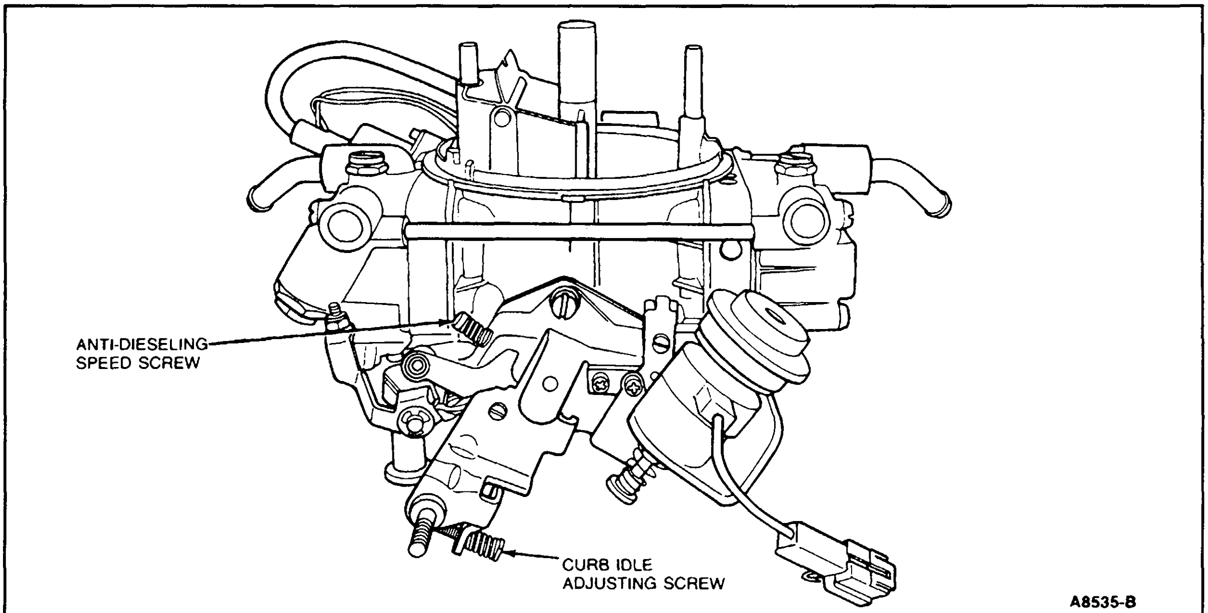

Figure 2 7.0L Engine with 4190 EG-4V-Curb Idle and Anti-Dieseling Adjustments

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Idle Speed Setting Procedures

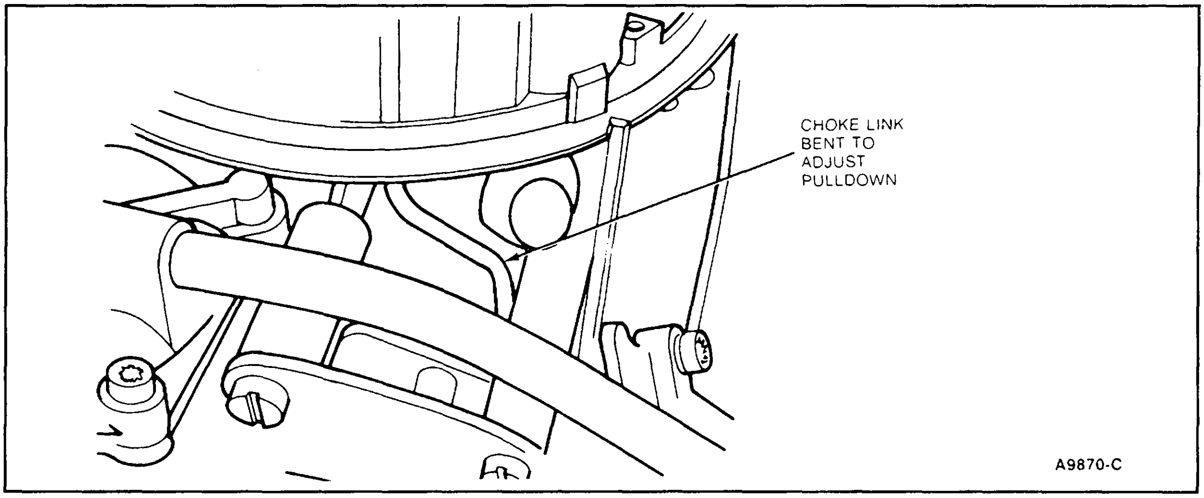

Figure 3 7.0L Engines with 4190 EG-4V — Choke Plate Pulldown Clearance Adjustment

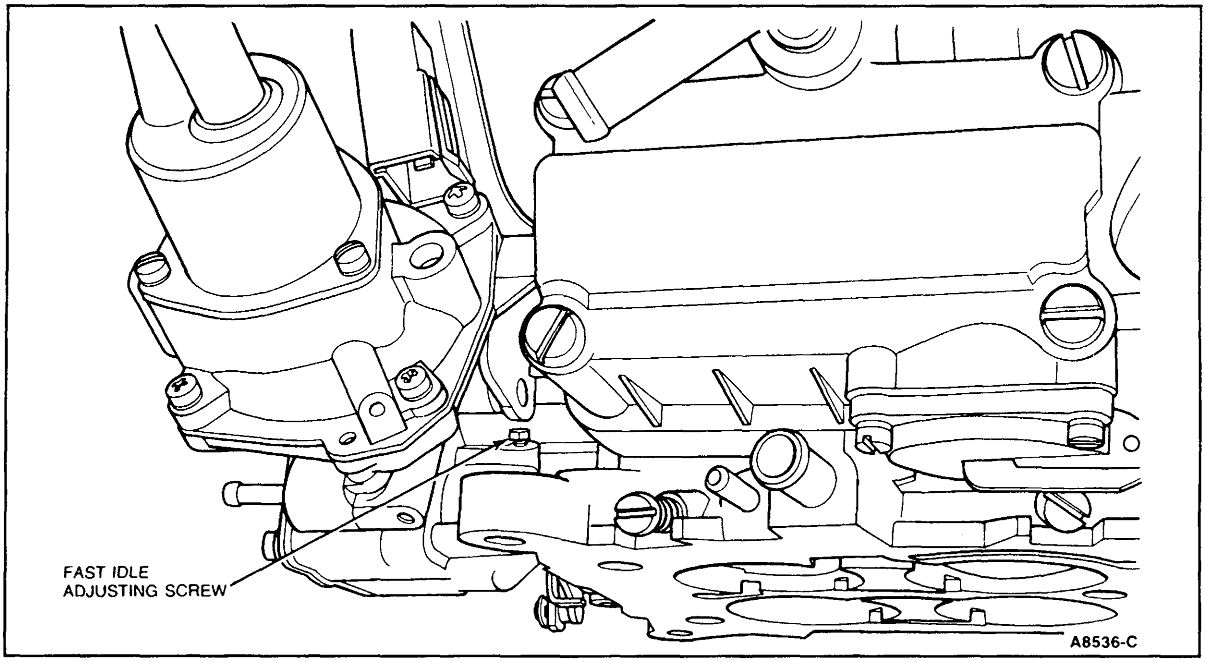

Figure 4 7.0L Engines with 4190 EG-4V-Fast Idle Speed Adjustment

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Idle Speed Setting Procedures

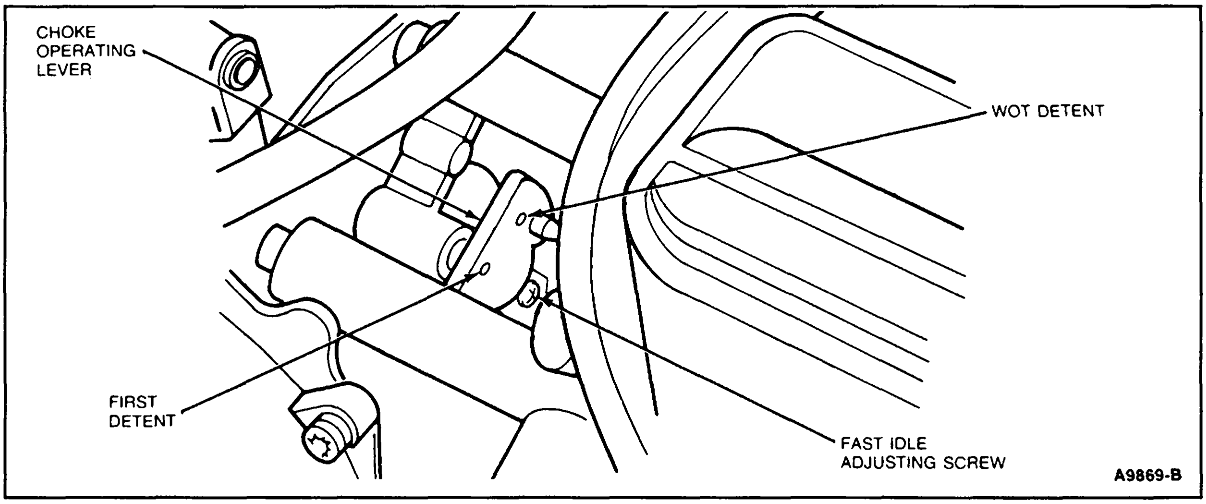

Figure 5 7.0L Engines with 4190 EG-4V — Fast Idle Speed Adjustment

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Idle Mixture Setting Procedures

IDLE FUEL MIXTURE — PROPANE ENRICHMENT METHOD

NOTE: This procedure is for 6.1L and 7.0L Truck gasoline engines with Holley carburetors Model 2380 EG 2V and Model 4190 EG 4V for 1985-1989. If CO and HC are not within specification, go to Diagnostic Routines in Section 2. Also refer to Maintenance Schedule.

1. Start engine and bring to operating temperature with transmission in NEUTRAL, parking brake on, and air cleaner installed.
2. Connect tachometer, Rotunda model 059-0001, 099-0001 or equivalent.
3. Disconnect the fuel evaporative purge hose from the top of the "F" fitting on the top of the PCV valve. Cap the fitting.
4. Disconnect the flexible fresh air tube from the air cleaner duct. Using Propane Enrichment Tool T75L-9600-A or equivalent, insert the tool hose approximately three-quarters of the way into the air cleaner duct. If necessary, secure the hose with tape.
5. Locate the crankcase vent hose and disconnect at the air cleaner end, allowing the hose to vent to underhood air during Idle Fuel/Air Mixture Check.
6. With the transmission in NEUTRAL, run the engine at approximately 2500 rpm for 15 seconds before each mixture check.
7. Check the engine idle speed in neutral. If necessary, set to the specification on the decal. On automatic transmission equipped vehicles, set the curb idle speed in drive but perform the Idle Fuel/Air Mixture Setting Procedure with the transmission in NEUTRAL.
8. Gradually open the propane tool valve and watch for engine speed gain, if any, on the tachometer. When the engine speed reaches a maximum and then begins to drop off, note the amount of speed gain. The propane cartridge must be in the vertical position.
9. The specified speed gain is 70-90 rpm (100-115 rpm above 4000 ft. altitude). Compare measured speed gain to specified gain. If the speed gain is not within the specified speed gain, remove the carburetor and access the idle mixture screws by removing the tamper resistant concealment plugs (see Group 24 in the medium/heavy truck shop manual, volume E for procedure). Seat both mixture screws using a 3/32 inch Allen Wrench or mixture adjusting tool. Back out idle mixture screws equally 1 to 1-1/4 turns off seat. Install carburetor replacing both the carburetor-to-spacer and spacer-to-manifold gaskets.

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Idle Mixture Setting Procedures

Recheck the measured speed gain.

a. If the measured speed gain is higher than the speed gain specification, turn the mixture screws counterclockwise in equal amounts repeating steps 6 and 8 until the measured speed gain is in the range of the specified speed gain.

b. If the measured speed gain is lower than the speed gain specification, turn the mixture screws clockwise in equal amounts repeating steps 6 and 8 until the measured speed gain is in the range of the specified speed gain.

10. When the measured speed gain is within the specified speed gain, turn off engine.
11. Re-install concealment plugs.
12. Re-connect the fuel evaporative purge hose to the top of the "F" fitting on the PCV valve. Re-connect the crankcase vent hose to the air cleaner.
13. Remove all test equipment.

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Cold Enrichment System

PASSENGER CAR

COLD ENRICHMENT SYSTEM — MOTORCRAFT 7200-VV

I. Pre-Check Instructions

A. Apply parking brake and block the wheels.

B. Remove the air cleaner assembly and plug the vacuum hose(s) leading to the air cleaner.

1. With the choke cap cool to the touch, turn the ignition key to the RUN position **without** starting the engine for two minutes. The choke cap should not be warm to the touch.

2. Start the engine if the cold enrichment rod is up when the fast idle cam is freed from the fast idle lever. Run the engine; do not exceed three minutes. The cold enrichment rod should seat. Turn the engine off.

C. Manually set the fast idle lever on the specified step (refer to Engine Emission Decal) of the cam, counting the highest step as the first.

D. Start the engine and bring it to normal operating temperature.

E. Open the throttle and check to see if the cam freely falls to the full off position. If it is functioning properly, there should be a definite drop in engine speed when the throttle is released.

F. Turn off the engine.

II. Freedom of Linkage and System Integrity Check

A. Verify that vacuum hoses, solenoid and electric choke wires are properly connected and intact. Check to make sure all carburetor hold-down nuts are tightened to specification. Correct as required.

B. Check all carburetor linkages for freedom of operation. If no binding exists, proceed to Section III. If binding exists, proceed to C.

C. Cold Enrichment Rod Mechanism Check

1. Check for damaged, foreign, missing and/or misaligned parts. Check for dirt, grease, or any foreign material on moving parts. Service or replace as required.

   If linkage is serviced or replaced, check choke adjustments. Reset if necessary.

2. Remove the retaining E-ring that holds the choke control rod to the choke shaft lever, then disengage the linkage from the lever.

3. Open the throttle slightly and check the choke shaft lever for freedom of movement. The choke cap and the pulldown diaphragm return spring should provide the only resistance, and the choke shaft lever should spring back to the original position. Clean, service or replace as required.

4. To check if the carburetor has a sticking/binding CER, perform the following procedure.

   a. Open the throttle to allow fast idle cam to move to "choke on" position.

   b. Hold the choke pulldown diaphragm in its retracted position.

   c. Push the CER down to its seated position. Feel for any friction/binding.

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Cold Enrichment System

d. Release the CER; it should return to its original position automatically (room temperature or colder).

e. Observe the upward movement of the CER for any indication of sticking/binding.

f. Rotate the CER 90 degrees from its original position and repeat Steps b through e.

NOTE: CER can be rotated using your fingers if the rod is placed in its full up position. The number identification on top of the CER can be used for determining the 90 degree rotation requirement.

g. Rotate the CER another 90 degrees (total of 180 degrees from its original position) and repeat Steps b through e.

5. Verify if the carburetor has a sticking/binding CVR with the following procedure:

   a. Hold the choke pulldown diaphragm in its retracted position.

   b. Place the fast idle lever on the highest step of the fast idle cam.

   c. Push the CVR down to its seated position. Feel for any friction/binding.

   d. Release the CVR, 70°F or warmer, the CVR should lift-off its seat automatically, colder than 70°F, push down on the CER to lift the CVR.

   e. Observe the upward movement of the CVR for any indication of sticking/binding.

6. If cam movement is still not free, remove carburetor from vehicle, then remove the throttle body from the carburetor. Remove the choke cap, the choke shaft and lever assembly, and the fast idle cam. Check the surfaces of all parts for grease, foreign material, bends, cracks, or distortion. Clean or replace parts as required. If a new fast idle cam is installed, adjust cam set according to procedure in Section V, and tighten to specification.

7. If movement is okay, make sure the choke control rod is connected to the choke shaft lever with the retaining E-ring. If the "CVR" causes binding, replace and reset, as outlined in Section V and Shop Manual, Group 24.

8. Reinstall the carburetor, as outlined in Section VI.

III. Electric Choke Functional Test

A. Choke Circuit Test

NOTE: Refer to body wiring diagrams for detailed information on electrical circuitry affected in this test. Two different types of circuitry are used. For battery powered choke, the choke cap and the oil pressure switch are connected in series through the wiring harness connectors.

For alternator powered choke, the choke cap wire is connected to the alternator stator terminal connection.

Either type is readily identifiable by visually tracing the routing from the choke cap terminal.

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Cold Enrichment System

To perform continuity tests of Section III Steps A-1 and -2, listed below, disconnect the stator terminal of the alternator for alternator powered choke. Reconnect after completion of testing.

1. Choke Cap Continuity

   a. Turn ignition switch off.

   b. Connect one end of a test lamp to the positive terminal of the battery and the other end to the choke cap terminal. The test lamp should light, indicating continuity. If it does light proceed to Step 2, if it does **not** light continue with Step c.

   c. Connect one end of a jumper wire to the choke cap clamp shroud and the other end to the negative terminal of the battery. Also connect one lead of a test lamp to the positive terminal of the battery and the other lead to the choke cap terminal.

   d. The test lamp should light indicating continuity; if not, connect the jumper wire directly to the choke cap ground; if the lamp lights, correct the poor contact between the choke cap clamp shroud and the choke cap ground. If the lamp does not light, replace the choke cap.

2. Continuity of all other circuit components, battery powered choke.

   a. Turn engine and ignition switch off.

   b. Disconnect oil pressure switch from harness, use a jumper wire in place of the switch to complete the circuit.

   c. Connect one lead of a test lamp to the negative terminal of the battery and the other lead to the choke cap terminal.

   d. Turn the ignition key to the RUN position without starting the engine. The lamp should be lit. If not, locate and service the open circuit by checking fuse, fuse link, connector, etc.

   e. Remove the jumper wire used as a substitute for the oil pressure switch; reconnect the harness lead wire to the oil switch terminal.

   f. Turn the ignition switch to the RUN position without starting the engine. The test lamp should not indicate continuity. If the lamp indicates continuity, the oil pressure switch is defective.

   g. Start the engine. The test lamp should indicate continuity. If the lamp does not indicate continuity, the oil pressure switch is defective.

3. Continuity of all other circuit components, alternator powered choke:

   a. Connect one lead of a test lamp to the choke cap ground and the other lead to the negative terminal of the battery.

   b. Start the engine, the test lamp should indicate continuity. If not, locate and service open circuit between choke cap to alternator stator terminal. If no open circuit is found, check alternator output and service as required.

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Cold Enrichment System

B. Choke Control Diaphragm Check

1. Check for bending, misaligned linkage, broken parts, contamination and/or loose parts. Service as required.

NOTE: The vacuum system used is:

a. **Externally Ported Vacuum With Fuel Separator/Filter:** A vacuum connector tube is provided on the diaphragm cover, and the vacuum line runs directly from this tube to the Fuel Separator/Filter to the manifold vacuum tap.

2. Running Engine Test

Start the engine and watch for the choke diaphragm rod to retract. If the retraction timing is within specification listed in Special Specifications Issue TSB Publications, the choke control diaphragm is functioning properly and no further check is necessary.

If the timing is out of specification or there is no retraction, the check must be continued. For Externally Ported, No Vacuum Trap or Externally Ported with Vacuum Trap, continue the check with Step 3 following.

3. Diaphragm Inspection, Cover Removed.

a. Remove the diaphragm cover and the diaphragm as outlined in Shop Manual, Group 24 (removal of the carburetor is not necessary, but helpful).

b. Visually inspect the diaphragm. If cut or torn, replace the diaphragm with a new one and assemble it with the original cover on the carburetor and continue with Step C.

If the diaphragm is not cut or torn, replace the cover with a new one and assemble it with the original diaphragm on the carburetor and continue with Step C. Ensure the assembly is sufficiently tight to prevent vacuum bleed-off at diaphragm mounting.

c. Connect a vacuum line from the connector tube on the diaphragm cover to a powered vacuum source. Apply 60 kPa (18 in-Hg) vacuum to the diaphragm and proceed with one of the following substeps, depending upon how the carburetor reacts to the vacuum:

1. It retracts the diaphragm within the specification timing. No further check is necessary since the control diaphragm is functioning properly. Adjust any CER setting affected by component replacement per Section IV, Step B.

2. It does not retract the diaphragm within specification or it does not retract at all. Replace the cover with a new part, assemble* it with the existing diaphragm onto the carburetor, and repeat this test again. Be sure the assembly is sufficiently tight to prevent vacuum bleed-off at diaphragm mounting.

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Cold Enrichment System

C. Choke Cap Resistance Test

1. Connect one lead of an ohmmeter to choke cap terminal and the other lead to choke cap ground. Ensure metal-to-metal contact is achieved (not metal-oxide film-metal) and false readings are prevented. Throughout this test, the ohm reading should be under 30 but never zero. At any point of this test, if the ohm reading is outside this range, start the test all over. If this same improper reading repeats, the choke cap is defective. The cap should be replaced as outlined in Shop Manual, Group 24.

2. With the choke cap connected electrically, start the engine and run for three minutes. Shut the engine off. During this three minutes, the CER should remain seated for an engine which was warm at the beginning. This rod should gradually lower to seat for an engine which was cold at the beginning. If the CER does not respond this way, note this fact and continue on with the test.

3. The choke cap should be quite warm to the touch now. Using choke tester, cool the cap down by directing cold air toward the oval-shaped insulator (not the case) around the cap terminal. The ohm reading should gradually vary and eventually a sudden increase is noticeable. Stop the cooling. This sudden increase should take place within 10 minutes since cooling began, if the Rotunda tool is employed at maximum effectiveness and was placed as close to the cap as possible. If this sudden resistance change does not take place within the above time limit, the choke cap is defective and should be replaced as outlined in Shop Manual, Group 24. If this sudden change takes place within this time limit, continue on with the testing.

4. Using the choke tester of Step 3 (or equivalent), warm up the cap by directing hot air toward the oval-shaped insulator. The ohm reading should vary gradually and eventually a sudden decrease is noticeable. Stop the warming. This sudden decrease should take place within 10 minutes since warming began, if the tool is employed at maximum effectiveness and was placed as close to the cap as possible.
possible.

   If the sudden resistance change does not take place within the above time limit, the choke cap is defective and should be replaced as outlined in Shop Manual, Group 24.

   If this sudden change takes place within this time limit, the choke cap has been checked-out all right as far as its resistance is concerned; it generates heat in the way it should.

5. The choke cap test itself is concluded. However, if the CER response in Step 2 is not proper, the procedure shown in Section II should be performed to identify and service the linkage-related problem that causes this improper response.

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Cold Enrichment System

IV. Carburetor Choke Adjustment — CER, CVR Settings

CER 24°C (75°F) Run, CER — 18°C (0°F) Start and Control Vacuum Regulator Setting

A. Cold Enrichment Rod (CER) Adjustment Sequence

NOTE: The CER mechanism affects carburetor air/fuel mixtures throughout engine operation, cold and warm. Several adjustments are required. Although each adjustment does affect a particular phase of operation, and each "maladjustment" can lead to a particular performance symptom, the adjustment procedure must be performed completely and in the following described sequence to provide desired CER performance.

If adjustment cannot be accomplished due to epoxy in the adjustment nut, a new service assembly (9F685) must be installed. Refer to Step B.

1. Remove carburetor from engine.
2. Assemble Dial Indicator Kit TOOL-4201-C or equivalent, to carburetor.

   NOTE: CER adjustment specifications are listed on a tag attached to the carburetor above the choke cap (Figure 1), and published in the Special Specifications Issue TSB Publications.
3. Remove choke diaphragm cover and spring.
4. Remove choke cap according to appropriate instructions.
5. Compress the idle speed positioner where applicable and insert a 5/16-1/2 inch spacer between the positioner stem and the throttle lever contact paddle. Retain in this position with a rubber band. This will locate the fast idle pick-up lever away from the cam and allow the cam to rotate freely.
6. Install Stator Cap T77L-9848-A or equivalent as a weight to rotate bimetal lever counterclockwise (CCW) and seat the CER.
7. Install dial indicator with tip centered on top surface of CER. Set the dial indicator to zero. Raise weight slightly and release to check for accurate zero.

NOTE: This adjustment will be the reference for other adjustments. Be sure dial indicator reading is accurate (Figure 2).

B. Control Vacuum Regulator (CVR) Swivel Assembly Replacement

Refer to Figure 3.

CVR/CER nuts have cylindrical projections above the threads which are filled with epoxy after final adjustment. To adjust, the existing parts must be removed and a new assembly installed. After adjusting, CVR/CER nut cavities must again be filled with epoxy.

1. Remove the E-clip and hinge pin.
2. Turn the CER adjusting nut counterclockwise until nut disengages from rod.
3. Remove the CVR and swivel assembly. Replace with new assembly.
4. The unbroken rod must be in place first before further assembly. Install the assembly and tighten the CER adjusting nut to lower and locate into position. Connect lever to swivel.

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Cold Enrichment System

5. Install the hinge pin and E-clip.
6. For CVR/CER adjustments, refer to Step 3.
7. Fill two nuts and stop screw with MT13 epoxy or equivalent.

   NOTE: The rod has an undercut designed to break, if breakage does occur, a new rod assembly must be installed. The upper body must be loosened to position the rod through the opening. Replace the upper body gasket as necessary (Fig. 4).

C. CER Run Position (24°C, 75°F) Adjustment

Refer to Figure 5.

1. Install stator cap and rotate clockwise (CW) to index. Dial should indicate the tag specification for Run at 24°C (75°F) ± 0.010 inch.
2. Adjust by turning choke adjusting nut CW to increase or CCW to decrease height.

D. CER Start (Crank) Position (18°C, 0°F) Adjustment

Refer to Figure 6.

1. Remove stator cap.
2. Rotate choke bimetal lever CW until CER travel stop screw bottoms on choke seal retainer (full travel). Dial should indicate the tag specification for Start at 18°C (0°F) ± 0.005 inch.
3. Adjust by turning CER travel stop screw with 5/64 inch hex wrench, CW to decrease or CCW to increase height.

E. Choke Diaphragm Start (Crank) Position for Warm Engine (24°C, 75°F)

Refer to Figure 7.

1. Push in diaphragm assembly. Dial should indicate the tag specification for Start at 24°C (75°F) ± 0.020 inch.
2. Adjust by rotating the diaphragm assembly CW to decrease or CCW to increase height.

F. Control Vacuum Rod (CVR) Position

Refer to Figures 8 and 9.

1. Seat CER again using stator cap weight and check for zero dial indicator reading. Reset zero position of indicator if required. Remove stator cap weight (Figure 8).
2. Depress the CVR until seated. Dial should indicate the tag specification for CVR ± 0.10 inch.
3. Adjust by holding CVR with 3/8 inch wrench, and turning adjustment with 3/32 inch hex wrench CW to decrease or CCW to increase height (Figure 9).
4. Reinstall original choke diaphragm cover with original spring.

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G. Choke Diaphragm Run Position for Cold Engine (−18°C, 0°F)

Refer to Figure 10.

1. Apply vacuum to choke diaphragm cover, or, depress choke diaphragm rod to seated position.
2. Rotate choke bimetal lever CW until choke shaft lever pin contacts fast idle intermediate lever. Dial should indicate the tag specification for Run at 0°F ± 0.005 inch.
3. If an adjustment is required, remove the choke diaphragm cover and install a new cover with the original spring. This is necessary due to tamper-resistant material on the adjustment screw.
4. Adjust by rotating screw in diaphragm housing with 5/64 hex wrench, CW to increase or CCW to decrease height.
5. Apply sealing liquid on adjustment screw to secure adjustment.
6. Install lead ball plug in adjusting screw hole.

H. Fast Idle Cam Setting

Refer to Figure 11.

Position fast idle pick-up lever on second step of fast idle cam against shoulder of high step.

1. Install stator cap and rotate CW until fast idle pick-up lever contacts fast idle cam adjusting screw. Dial should indicate specification 0.360 inch ± 0.005 inch.
2. Adjust by rotating fast idle cam adjusting screw.
3. Remove stator cap.
4. Assemble choke cap, gasket, and retainer with breakaway screws.
5. Remove dial indicator and rubber band.
6. Install carburetor and adjust idle speeds.

V. Post-Check Instructions

A. Inspect the gaskets and sealing surfaces between the carburetor and intake manifold. Service as required.

B. Reinstall the carburetor.

C. Reconnect all wire connections and hoses.

D. Check/adjust engine idle speeds.

E. Reinstall the air cleaner assembly and reconnect pertinent vacuum lines.* Tighten air cleaner wing nuts to specification.

Verify that air cleaner heat riser tube and fresh air pick-up connections are correct.

VI. Removal and Installation of Adjustment Limiting Choke Bimetal Housing and Enrichment Rods

A. Refer to Shop Manual, Group 24.

*Refer to the Special Specifications Issue TSB Publications.

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Cold Enrichment System

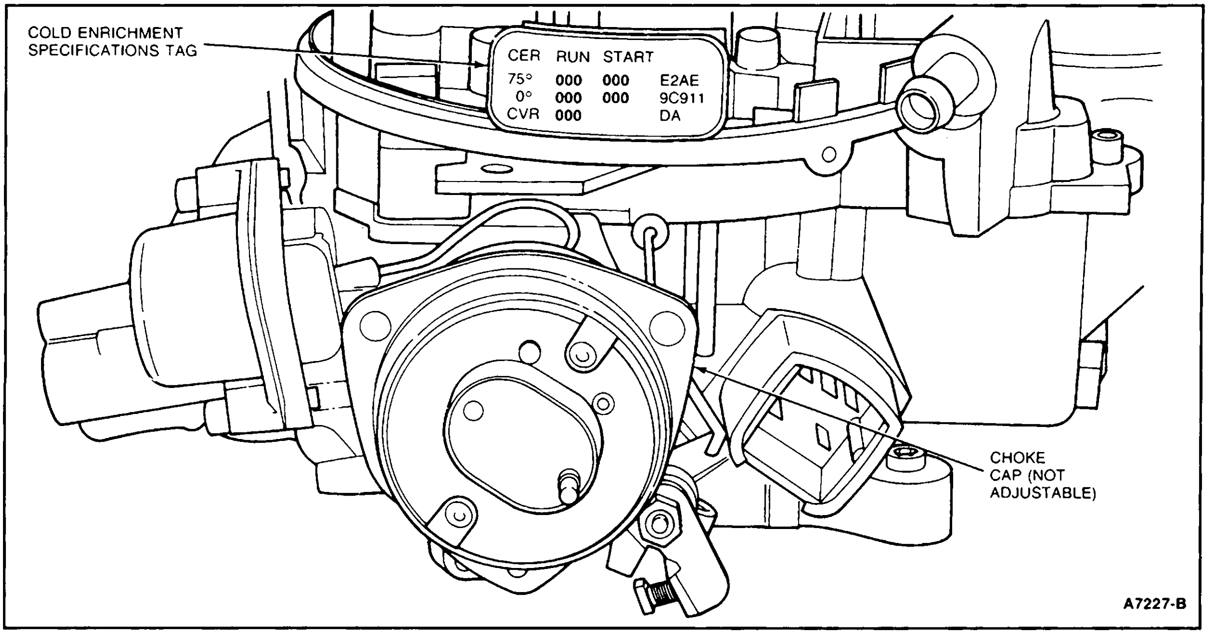

Figure 1 Cold Enrichment Rod (CER) Adjustment Sequence

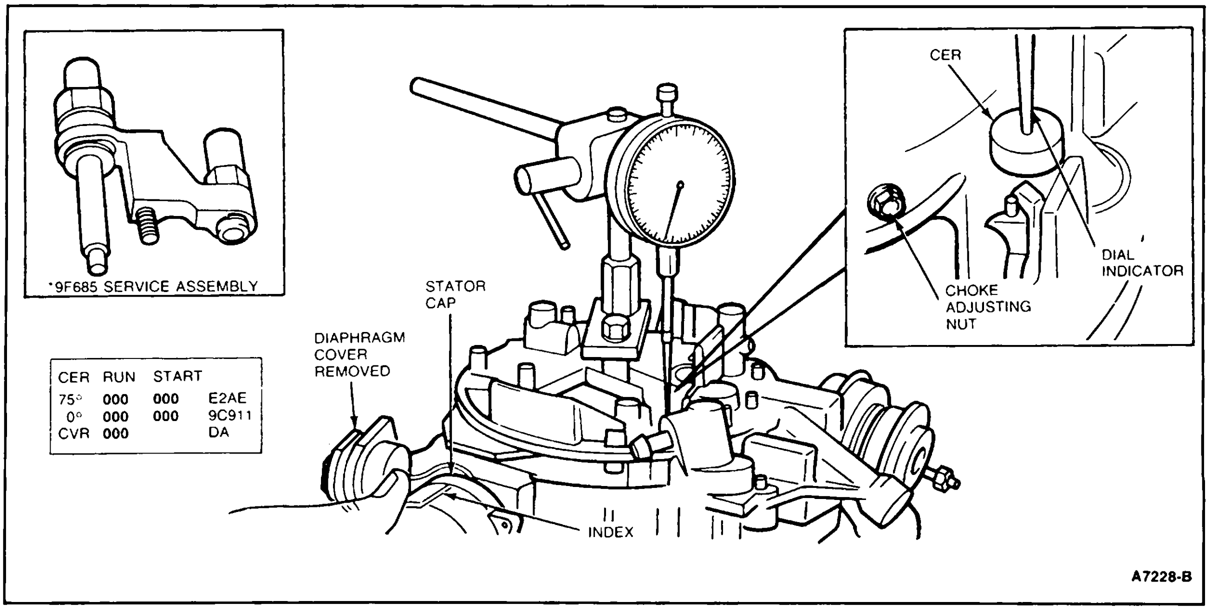

Figure 2 CER Run Position (24°C, 75°F) Adjustment

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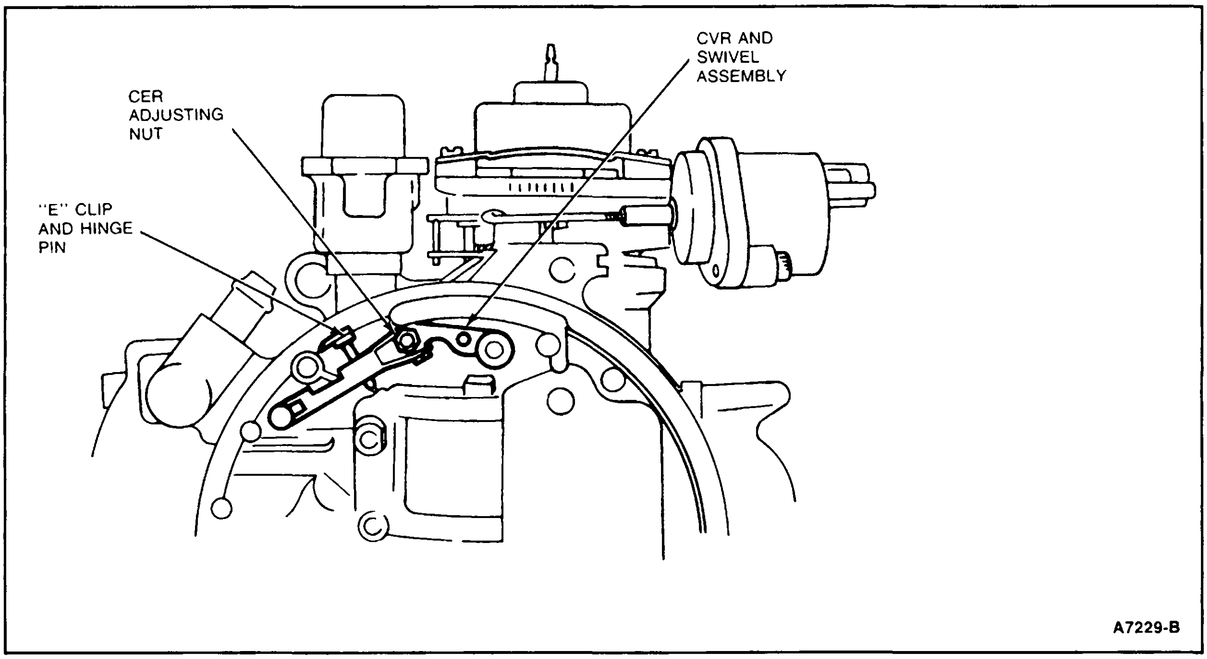

Figure 3 Control Vacuum Regulator (CVR) Swivel Assembly Replacement

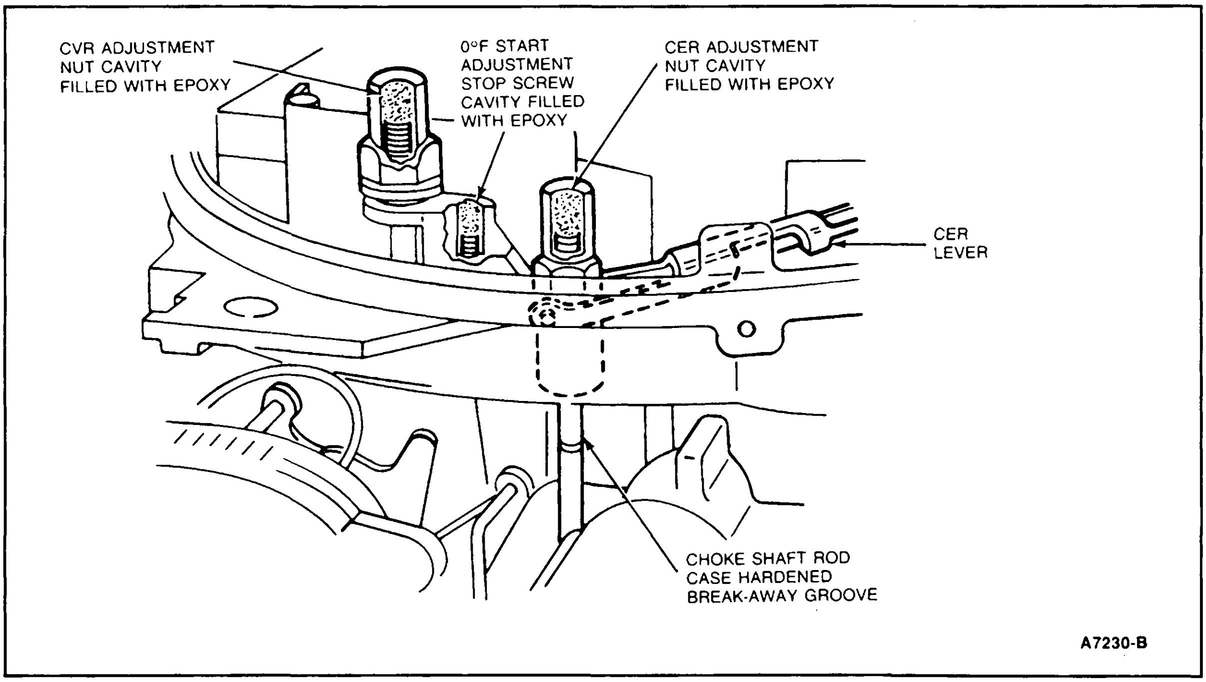

Figure 4 CER/CVR Tamper Resistant Installation

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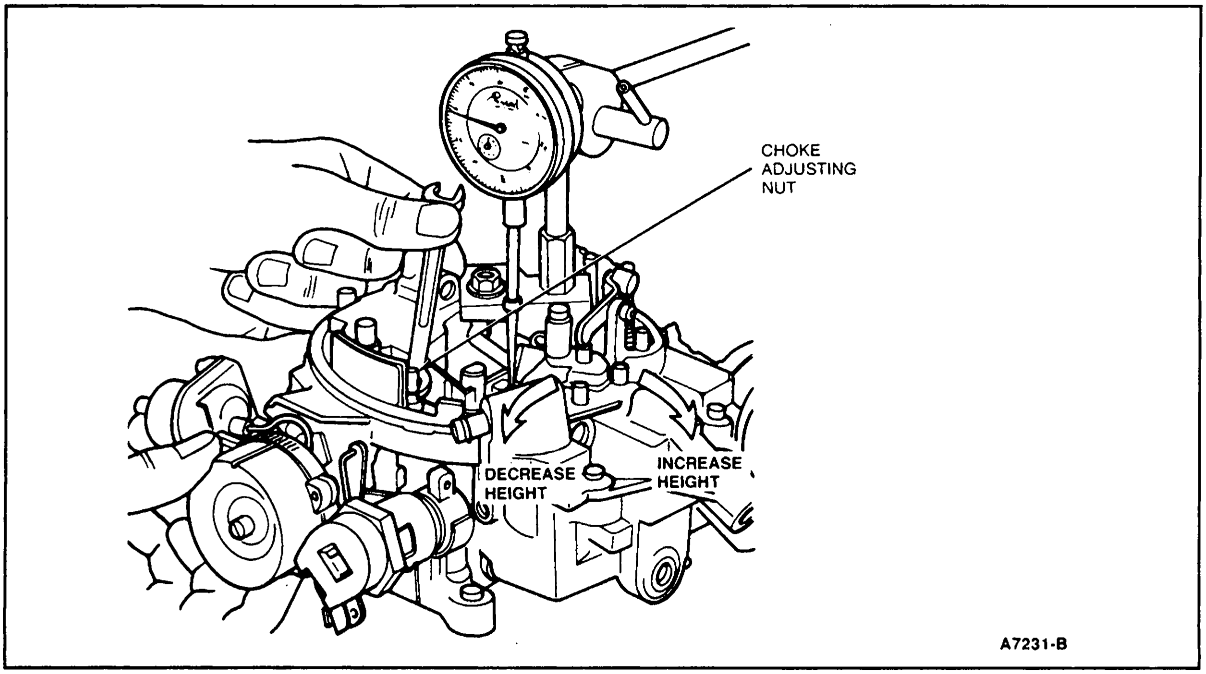

Figure 5 CER Run Position (24°C, 75°F) Adjustment

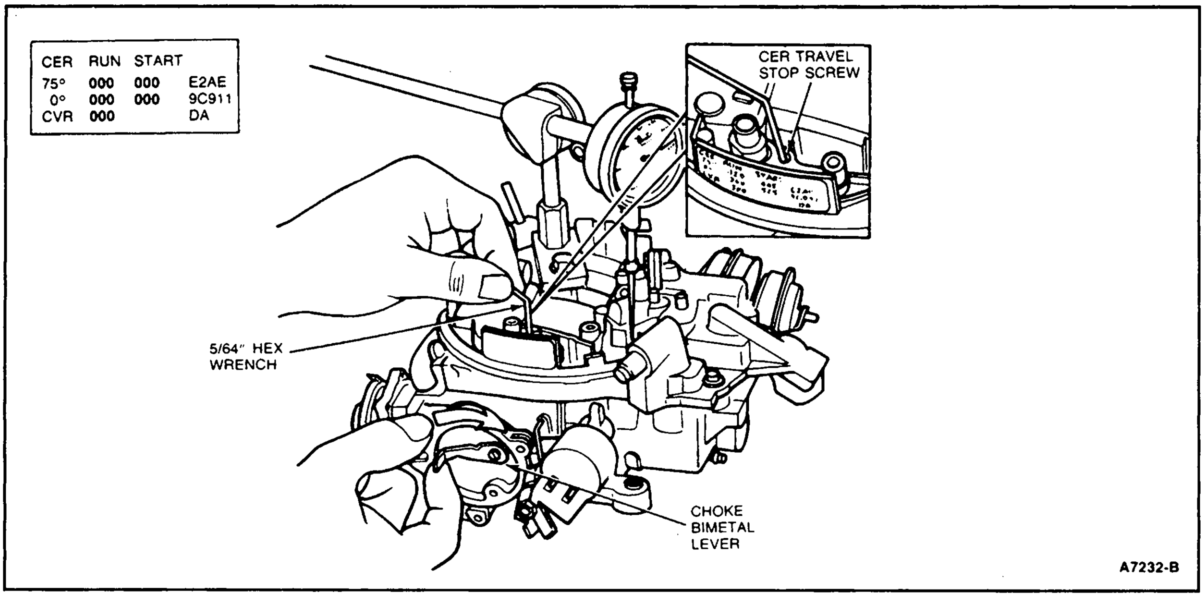

Figure 6 CER Start (Crank) Position (– 18°C, 0°F) Adjustment

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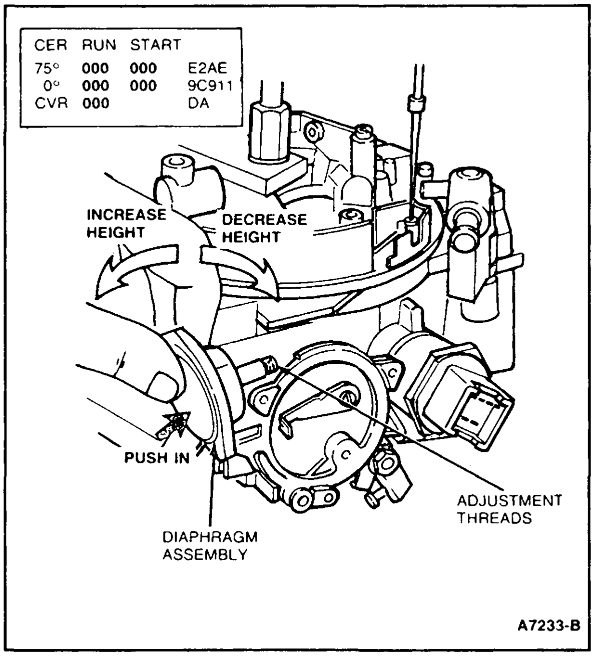

Figure 7 Choke Diaphragm Start (Crank) Position — Warm (24°C, 75°F)

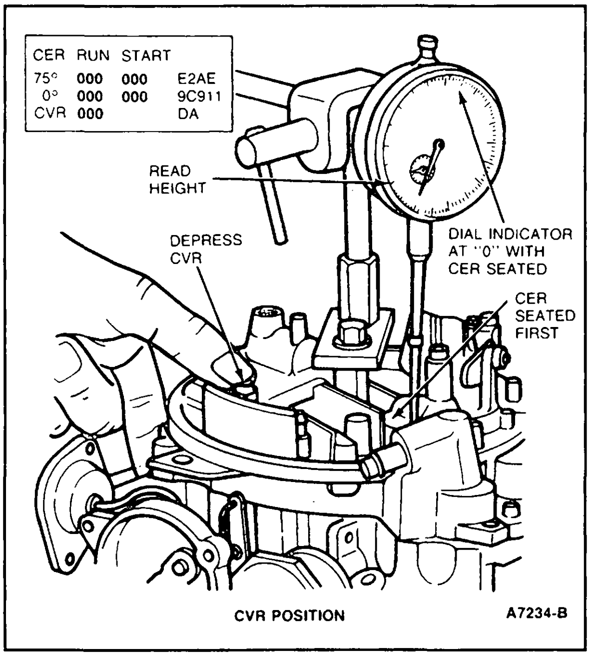

Figure 8 Control Vacuum Rod (CVR) Position — Check

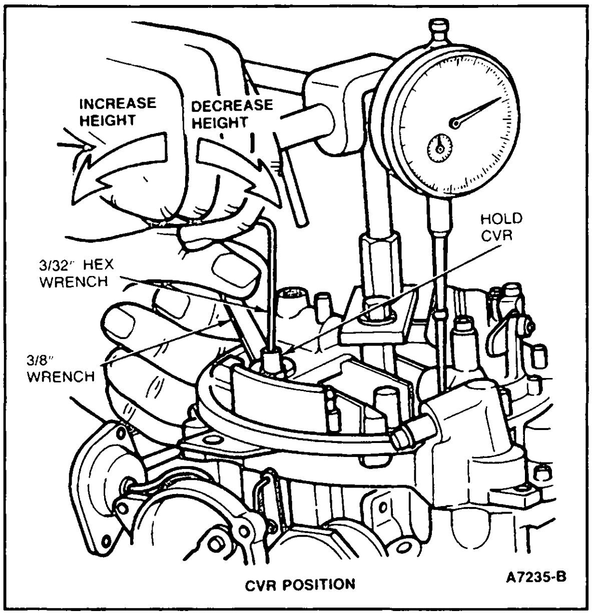

Figure 9 Control Vacuum Rod (CVR) Adjustment

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Cold Enrichment System

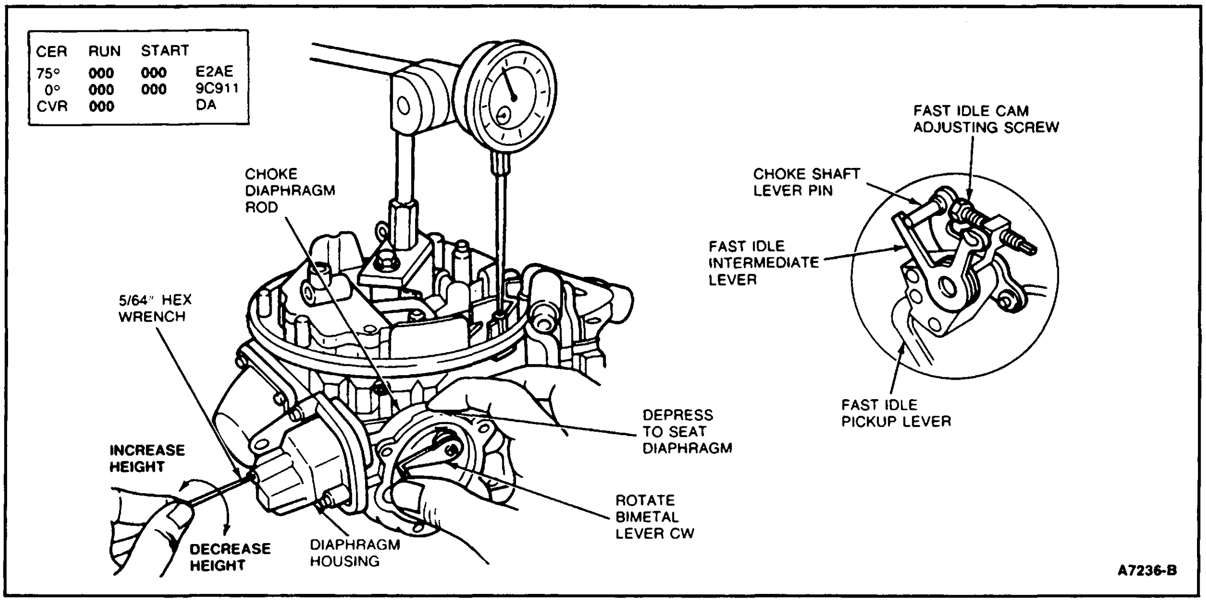

Figure 10 Choke Diaphragm Run Position for Cold Engine (– 18°C, 0°F)

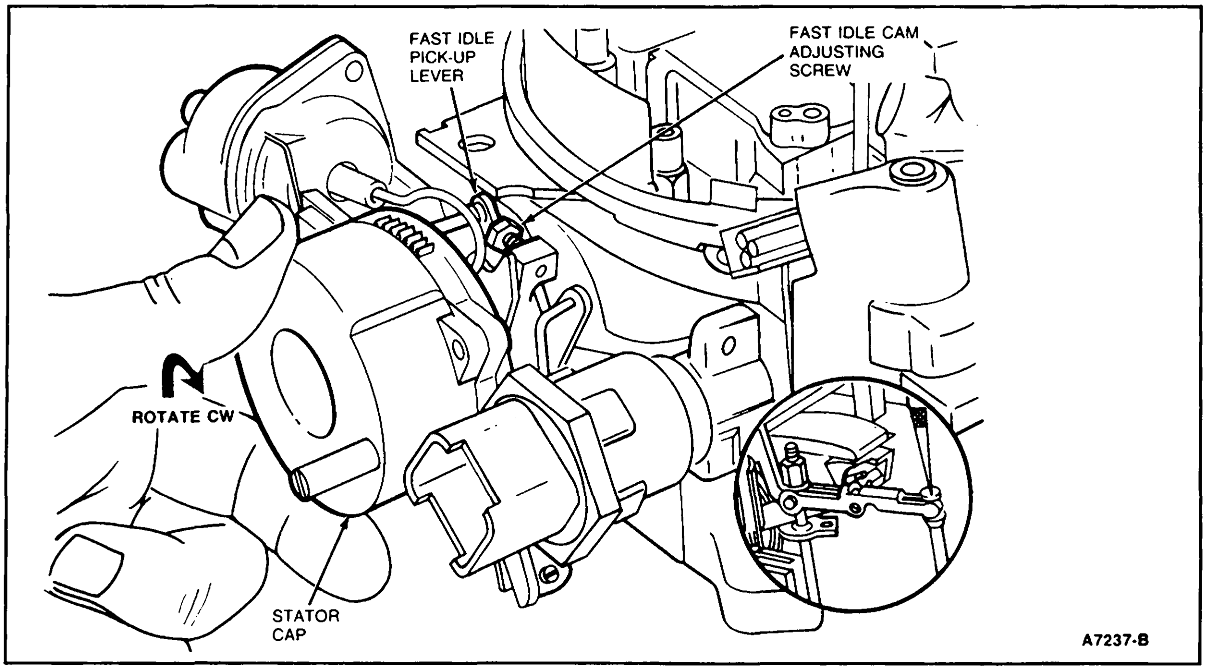

Figure 11 Fast Idle Cam Setting

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Choke Adjustment Procedure

TRUCK

MANUAL CHOKE CARBURETORS ONLY — HOLLEY 2380EG-2V and 4190EG-4V

I. Pre-Check Instructions

A. Apply parking brake, and block wheels. Manual/Auto transmission in NEUTRAL or PARK.

B. Bring the engine to normal operating temperature.

C. Remove the air cleaner assembly and plug the vacuum line(s) to the air cleaner assembly.

D. Disconnect choke cable from carburetor.

E. Check all carburetor linkages for freedom of operation. Service, replace or adjust as required.

F. Check for freedom of operation of choke plate for closing and opening in the air horn bore. Correct as required.

G. Reconnect choke cable and check choke plate travel using dashboard control. Depress throttle and pull choke full on. Choke should be fully closed in air horn bore. Depress throttle and push choke in. Choke should be fully open. Correct choke cable adjustment as required.

II. Post-Check Instructions

Reinstall the air cleaner assembly and reconnect pertinent vacuum lines. Tighten the air cleaner wing nut to specification.

*Refer to Shop Manual, Group 24.

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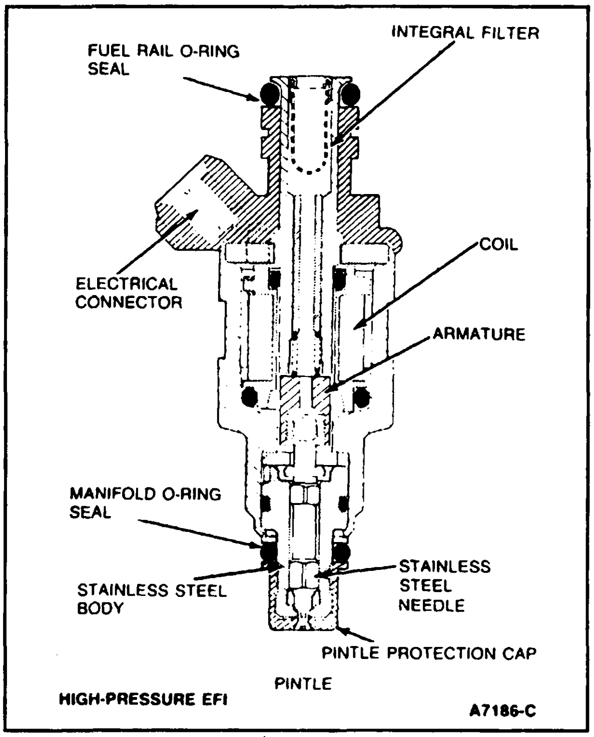
Fuel Injector Testing/Cleaning

High-Pressure, High-Resistance, High-Pressure, Low-Resistance Ported EFI Injectors Only

To help diagnose EFI fuel injector problems, use the following troubleshooting chart along with the Rotunda Fuel Injector Tester/Cleaner 113-00001 or equivalent.

The majority of fuel injector problems are due to plugged injectors caused by fuel deposits. These injectors can be cleaned and restored back to their normal operating condition.

If injectors will not clean, or have another of the listed problems, injectors must be tested before replacement.



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Fuel Injector Testing/Cleaning

FUEL INJECTOR TROUBLESHOOTING CHART

FOR HIGH-PRESSURE, HIGH-RESISTANCE AND HIGH-PRESSURE LOW-RESISTANCE PORTED EFI SYSTEMS ONLY

Symptom	Fuel Injector Failure Mode	Cause	Corrective Action
Rough Idle, Hard Start, Hot/Cold	Lean injector.	Tip deposits. (Plugged)	Clean injectors.
		Internal contamination.	Test/replace if necessary.
	Rich injector.	Stuck open. (Leaks)	Test/replace if necessary.
	Injector will not pulse.	Short or open circuit.	Test/replace if necessary.
Misses Under Load Hesitates or Stalls on Acceleration Backfires Lacks Power Surges at Steady Speed	Lean injector.	Tip deposits. (Plugged) Internal contamination.	Clean injectors. Test/replace if necessary.
Gas Smell	Injector stuck open.	Internal contamination.	Test/replace if necessary.
	Injector leaks internally (into intake manifold).	Internal contamination.	Test/replace if necessary.
	Injector leaks externally.	Defective O-Rings.	Test/replace if necessary.
NOTE: Test and clean injectors using the Rotunda Tester/Cleaner 113-00001 or equivalent.			

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Fuel Injector Tester/Cleaner

Fuel Injector Tester/Cleaner

The Fuel Injector Tester/Cleaner was designed to facilitate fuel injector servicing by cleaning and/or testing fuel injectors without removing them from the engine.

NO CLEANING SOLVENT IN TANK DURING INJECTOR TESTING

Fuel Injector Cleaning Instructions

1. Turn shutoff valve (Figure 3) at the back of test stand to ON (open) position.
2. Filter (use paint-type filter) and pour clean gasoline into tester fuel tank and fill to lower fill line for 8 cylinder vehicles (use less for 4 and 6 cylinder vehicles). Add injector cleaner solvent from lower fill line to upper fill line (7 ounces). Premixed gasoline and cleaner solvent may be used. Mixture: approximately 1 oz. of cleaner solvent to 7 oz. of unleaded gasoline per cylinder.
3. Connect power supply line (Figure 2) to vehicle battery (red terminal, positive; black terminal, negative). Red light (on cleaner side) will flash indicating power connection has been made and that the unit is off.
4. Activate the 10 minute timer switch, check pressure gauge. The gauge should read 38-40 psi. If adjustment is necessary, turn shutoff valve to ON (open) position, for resetting of regulator. Remove black cap, back-off locknut, turn screw to obtain proper setting and retighten locknut. Replace cap. Turn unit off.
5. Connect fuel supply hose to outlet (Figure 3) and place other end of hose back into tank. Actuate the 10 minute timer switch and turn the flowmeter selector valve to flowmeter No. 1 and then to flowmeter No. 2 and back to flowmeter No. 1. Repeat this procedure several times to eliminate all air from the system. Turn flowmeter selector valve to flowmeter No. 2 for all cleaning applications. This allows maximum flow. Turn unit off.
6. Disconnect engine fuel inlet line at the supply manifold (rail). Connect the supply hose from cleaning equipment to the fuel inlet (Figure 1).
7. Disconnect engine return line at the supply manifold (rail). Plug the return line as shown in Figure 1. Install the U-tube (supplied) between the chassis supply line and the chassis return line (Figure 1).
8. Install the turnbuckle (Figure 6) loosely between throttle control rod and suitable hook-up point on vehicle fender wall. Activate the 10 minute timer switch.

   CAUTION

   Be sure vehicle is in PARK or NEUTRAL position, parking brake on and/or wheels blocked front and rear.

   Start engine and check for leaks.
9. When the engine speed has stabilized, set the idle speed to 2000 rpm with the turnbuckle (Figure 6).
10. Reset the remaining 10 minute cycle (automatic). Turn ignition switch to OFF, remove turnbuckle.

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Fuel Injector Tester/Cleaner

11. Disconnect the cleaner supply hose from the fuel supply manifold connection inlet.

    Drain and discard remaining mixture from cleaner fuel tank.

12. Turn power switch off and disconnect power supply. Reinstall vehicle fuel lines. Start the engine and check for leaks.

    Install fuel connector retaining clips (N805522 inlet, N805521 outlet). When reinstalling vehicle fuel lines, lubricate O-rings. Put safety ring onto fuel line connector when reinstalling vehicle fuel lines on late models equipped with spring lock connectors. Safety indicator ring will pop off when connection is properly installed. Check for proper "seating of connection" by using hand force to separate connection, check for leaks.

Fuel Injector Testing

1. Turn manual shutoff valve (Figure 3) of test stand panel to OFF (closed) position.

2. Filter (use paint-type filter) and pour clean gasoline into the tester fuel tank, and fill to lower fill line for 8 cylinder vehicles, use less for 4 and 6 cylinder vehicles.

   DO NOT ADD ANY CLEANER SOLVENT IN TANK FOR TESTING.

3. Connect power supply line (Figure 2) to vehicle battery (red terminal, positive; black terminal, negative). Red light (on cleaner side) will flash indicating power connection has been made and the unit is off.

4. Activate the 10 minute timer switch, check pressure gauge. The gauge should read 38-40 psi. If adjustment is necessary, turn shutoff valve to ON (open) position, for resetting of regulator (refer to Figure 3). Remove black cap, back-off locknut, turn screw to obtain proper setting and retighten lock nut. Replace cap. Turn unit off.

5. Connect fuel supply hose to outlet (Figure 3) and place other end of hose back into tank. Actuate the 10 minute timer switch and turn flowmeter selection valve to flowmeter No. 1 and then to flowmeter No. 2. Repeat this procedure several times to eliminate all air bubbles from the system. Turn unit off. Flowmeter selection valve must be in position No. 1 or No. 2 for unit to function properly. Reinstall fuel tank cap snugly and back-off one turn.

6. Disconnect engine fuel inlet connection at the fuel manifold (rail). Connect the supply hose from testing equipment to the fuel inlet connection (Figure 1).

7. Disconnect engine fuel return connection at the fuel manifold (rail) from fuel return. Plug the return line as shown in Figure 1. Install the U-Tube (supplied) between the chassis supply line and the chassis return line (Figure 1).

8. Install the turnbuckle (Figure 6) loosely between throttle control rod and suitable hook-up point on vehicle fender wall. Activate the 10 minute timer switch.

   CAUTION

   Be sure vehicle is in PARK or NEUTRAL position, parking brake on and/or wheels blocked front and rear.

   Start engine and check for leaks.

9. Run the engine just long enough to eliminate all the air in fuel supply hose and fuel rail.

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Fuel Injector Tester/Cleaner

10. Select the proper flow range. Turn the flowmeter selection valve to **Flowmeter No. 1** for Blue, Grey or Yellow injectors, or **Flowmeter No. 2** for White, Black, Green or Brown injectors. The flow band colors correspond to the injector top color. (Color may vary slightly between manufacturers.)

    Refer to EFI Application Chart.

11. Install the tester injector harness (Figure 7) on the vehicle injectors. Match the injector number on the harness to that of the cylinder (or use 10 pin connector FA-412, Figure 8) for 5.0L engine (or 8 pin adaptor harness No. 6222 for 3.8L).
12. Position injector selector switch to each injector number while pressing fuel injector test button.
13. Observe the position of the flowmeter float at eye level when the ball stops rising. A float level within the color code range on the scale indicates a good injector.
14. To confirm initial test readings, a maximum of three testings on the set of the injectors can be performed restarting the engine.
15. Any injectors removed from an engine should be bench tested to confirm diagnostic conclusions. A continuity checker FA-407 (Figure 6) is provided to check continuity of injector harness leads between the injector and the ECM unit. Disconnect injector and insert continuity checker FR-407 into injector plug. Start engine. Observe. Continuity checker will blink showing completed circuit for that injector being tested.

NOTE:

a. If the flowmeter readings are high or low on the color code scale, the fuel injectors should be cleaned.

b. If all the readings are high, there may be leaky injectors (one or more). To check for leaky injectors, observe pressure gauge. It should hold pressure with the fuel pump off. If there is a pressure drop, detect the leaky injector by observing flowmeter (the leaky injector shows less flow). If this is not possible, remove all injectors and test individually. Refer to Bench Testing procedure.

c. If fuel injector cleaner is required, turn manual shutoff valve to the ON position. Refer to Fuel Injector Cleaning Procedure.

d. Testing may be performed before or after cleaning process.

Fuel Injector Bench Testing Procedure

Individual Injector Performance and Leakage Testing.

1. Check that the manual shutoff valve (Figure 3) at the back of test stand is in ON (open) position.
2. Fill the Tester/Cleaner fuel tank with several ounces of clean, fresh gasoline.
3. Connect the fuel supply hose FA-402 (Figure 4) to the fuel supply outlet (Figure 3) and to the Bench Fixture (Figure 9).
4. Insert injector to be tested in Bench Fixture as shown in Figure 9.
5. Connect the No. 1 tester harness connector (Figure 7) to the fuel injector. Turn the injector selector switch (Figure 3) to No. 1 position.
6. Direct the injector nozzle into the tester fuel tank.

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Fuel Injector Tester/Cleaner

7. Connect the power supply leads (Fig. 2) to the battery, observing correct polarity.
8. Activate the 10 minute timer switch and check for leaks.
9. Press the injector test switch (Figure 3) and the purge switch together for about 30 seconds to eliminate air from the supply hose and injector.
10. No leakage from the fuel injector nozzle tip should be visible. Replace any leaking injector.
11. Press injector test switch (Figure 3) to test injector, observe float in flowmeter.
12. Check the flowmeter readings and record all test results.

Factors That Cause False Flow Readings

- Air bubbles in the system fuel lines.
- Excessive amount of cleaner solution in the system.
- Fuel pressure other than recommended 39-40 psi for all high-pressure EFI vehicles. Refer to Section 11.
- Low voltage from a weak power source.
- Heat from prolonged engine running. Cool engine before retesting.

Use the following approved solvents: D9AZ-19579-B or E6AZ-19579-C only.

Service Maintenance

Periodically the flowmeters need cleaning. Follow the Matheson Instrument instructions enclosed or flush unit with denatured alcohol, allow the fluid to recirculate several minutes, switching flowmeter selection valve from No. 1 to No. 2 several times while unit is operating. Discard fluid. Reflush again using above procedure, discard fluid. Change filter.

To gain access to filter located under the front cover, refer to Figures 2 and 3, unscrew and remove the cover access bolts, each side and slide the cover off. Replace filter with in-line type filter. Change filter frequently.

When new injector applications are released, new calibrated flow tubes are available from Triangle Special Products Group. This unit is suitable for conversion for K-Jetronic fuel systems. If K-Jetronic fuel system cleaning is desired, a modification kit is available from Triangle Special Products Group.

NOTE: Triangle Special Products Group (Miller Special Tools) is a division of The Triangle Corporation.

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Fuel Injector Tester/Cleaner

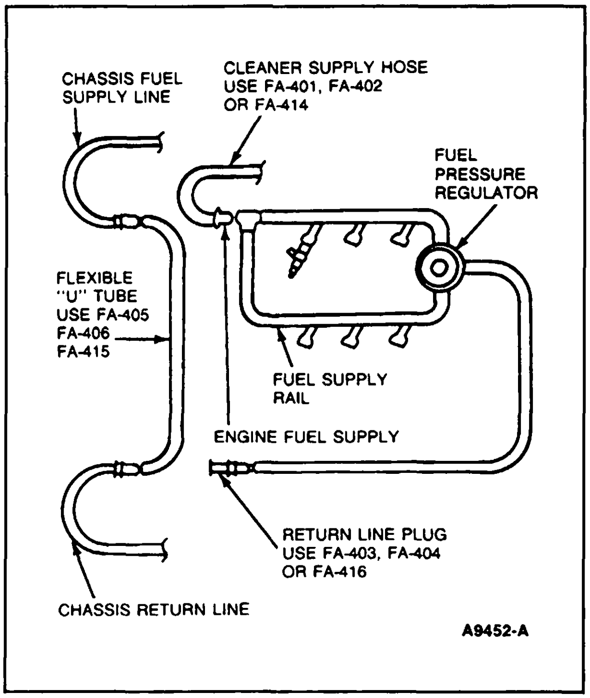

Figure 1

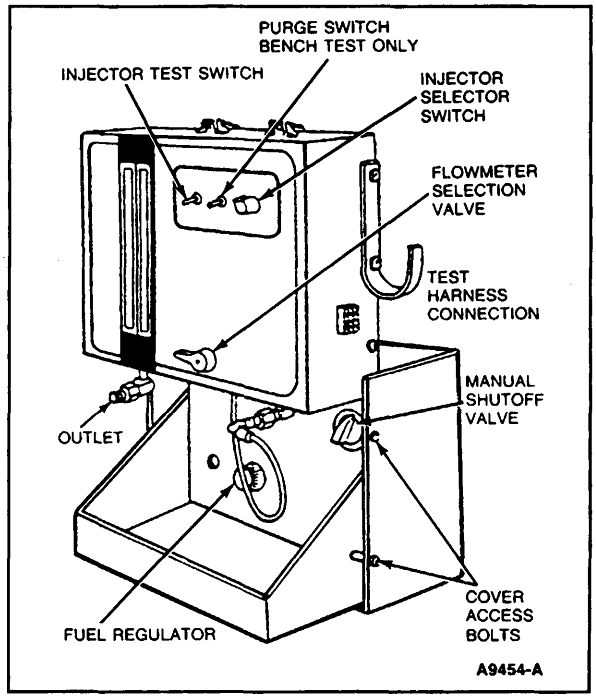

Figure 3

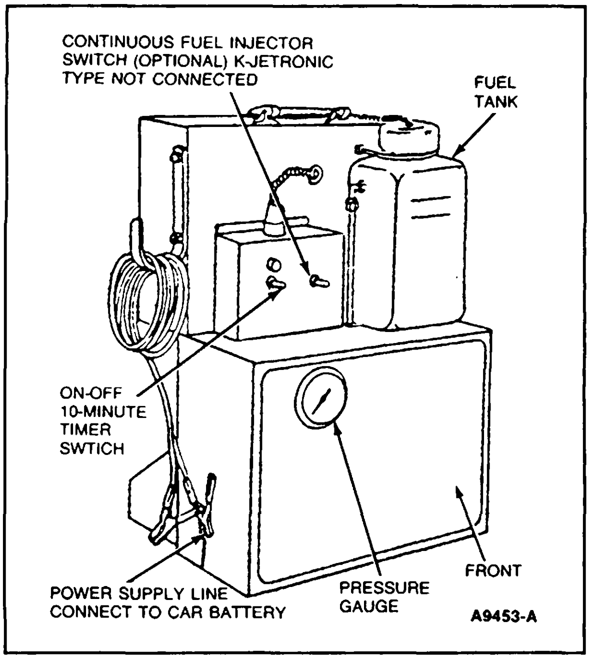

Figure 2

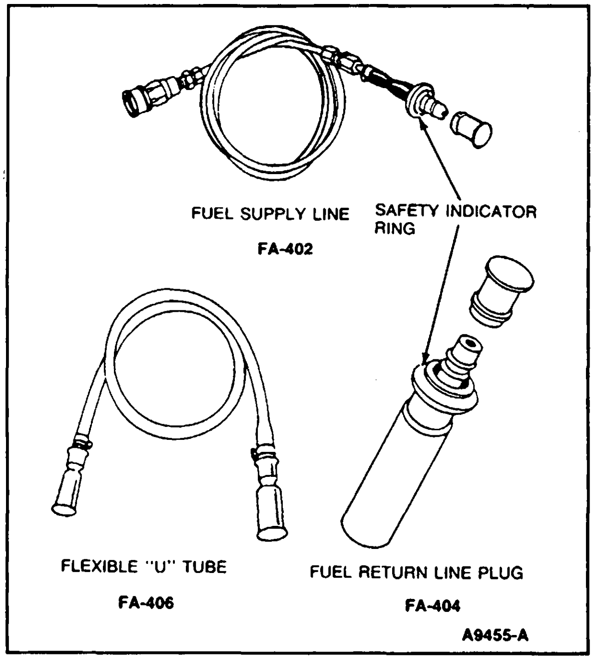

Figure 4

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Fuel Injector Tester/Cleaner

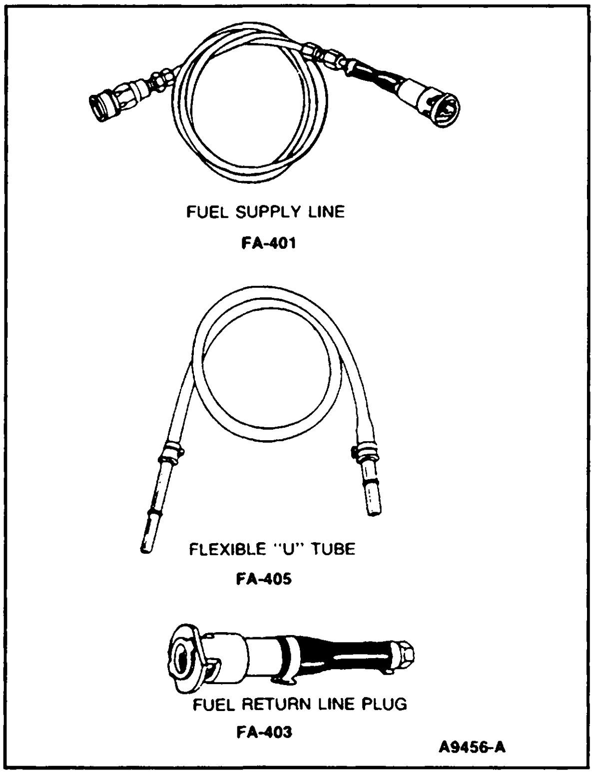

Figure 5

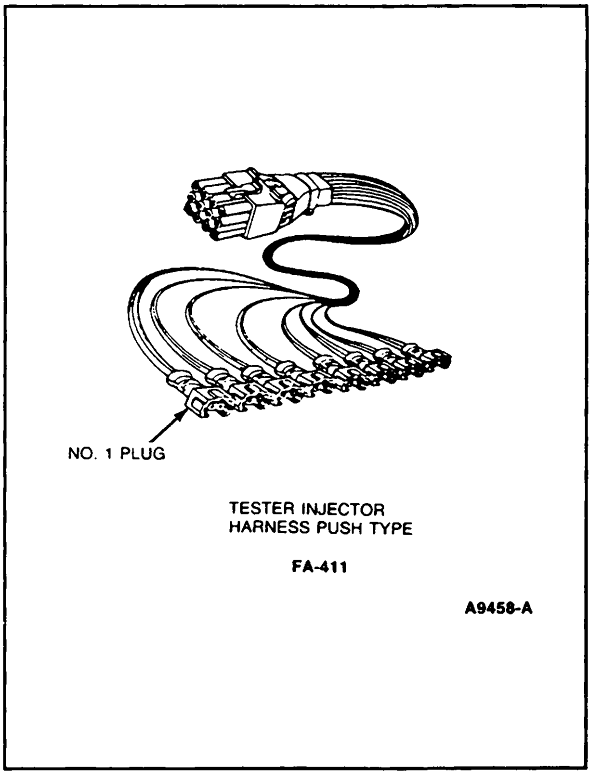

Figure 7

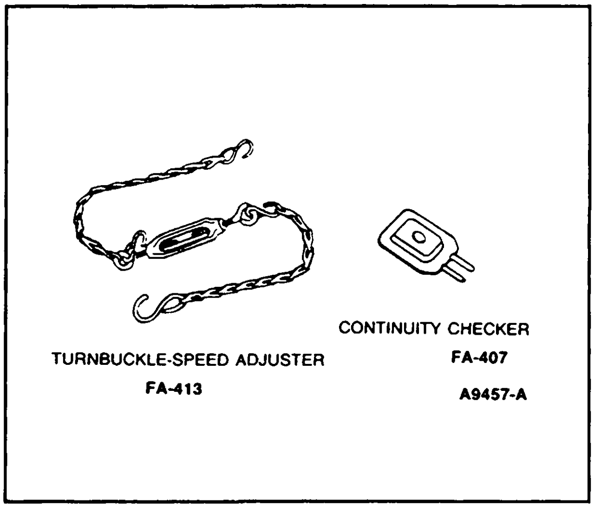

Figure 6

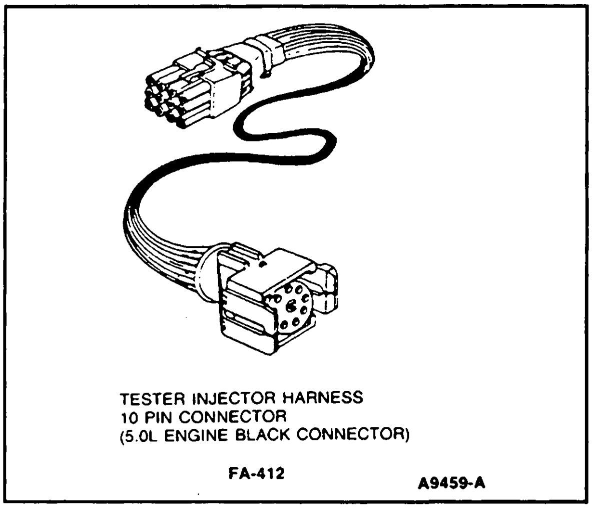

Figure 8

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Fuel Injector Tester/Cleaner

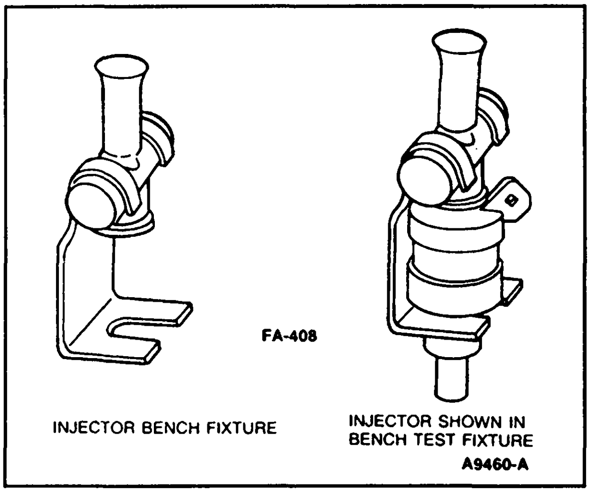

Figure 9

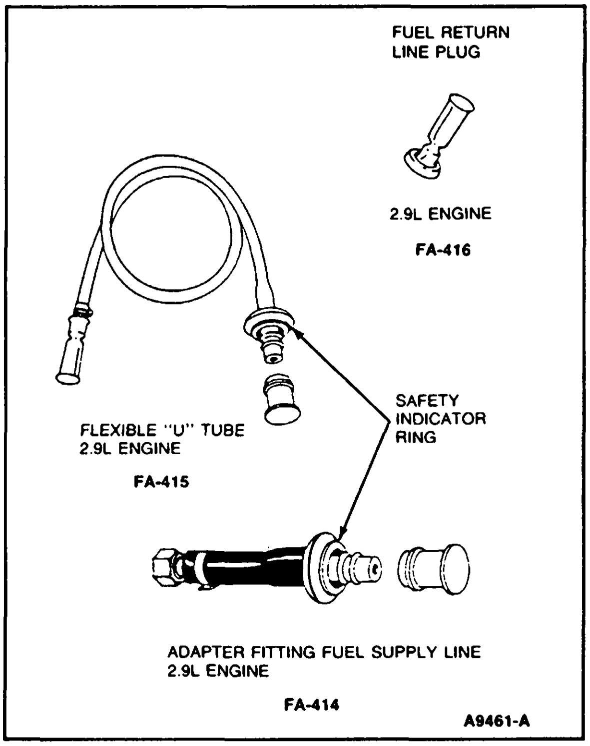

Figure 10

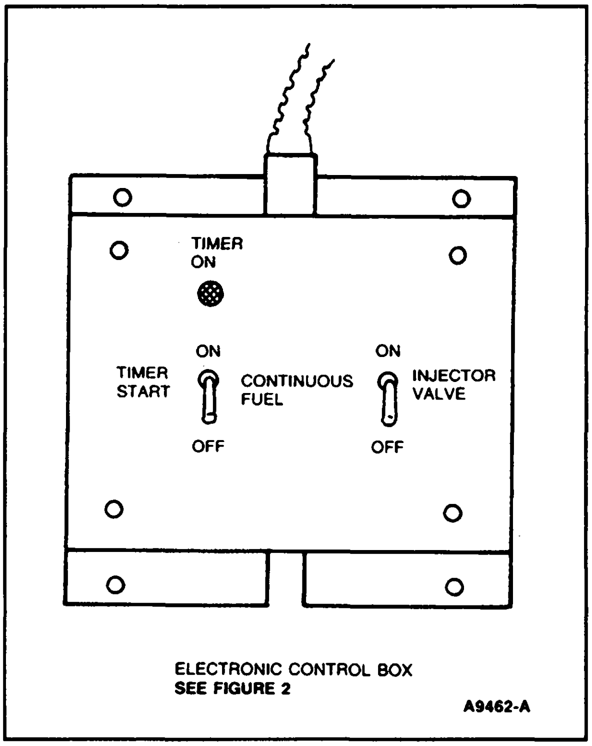

Figure 11

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EFI Injectors

Model Year	Engine Application	Source Source	#/HR	Part Number	Connector Color
1983	1.6L Car	Bosch	(14)	E3EE-9F593-BA	Dk. Blue
	2.3L T/C Car	Bosch	(30)	E3ZE-9F593-BA	Green
1984	1.6L Car	ND	(14)	E4EE-9F593-AA	Dk. Blue
	1.6L T/C Car	Bosch	(23)	E4EX-9F593-AA	Black
	2.3L T/C Car	DKK	(30)	E4ZE-9F593-AA	Green
1985	1.6L Car	ND	(14)	E4EE-9F593-AA	Dk. Blue
	1.6L T/C Car	Bosch	(23)	E4EX-9F593-AA	Black
	2.3L T/C Car	DKK	(35)	E5ZE-9F593-AA	Brown
	2.3L Truck	ND	(14)	E59E-9F593-AA	Gray
	5.0L Truck	Bosch/ND/DKK	(19)	E5TE-9F593-AA	Yellowish Orange
1986	1.9L Car	Bosch	(19)	E6EE-9F593-AB	White
	2.3L T/C Car	DKK	(35)	E5ZE-9F593-AB	Brown
	2.3L Truck	ND	(14)	E59E-9F593-AB	Gray
	2.9L Truck	Bosch	(14)	E67E-9F593-AB	Gray
	3.0L Car	ND	(14)	E59E-9F593-AB	Gray
	3.0L Truck	ND	(14)	E59E-9F593-AB	Gray
	5.0L Car	Bosch	(14)	E67E-9F593-BB	Gray
	5.0L HO Car	ND	(19)	E6TE-9F593-AB	Yellowish Orange
	5.0L Truck	DKK/Bosch	(19)	E5TE-9F593-AB/BB	Yellowish Orange
1987	1.9L Car	Bosch	(19)	E6EE-9F593-AB	White
	2.3L T/C Car	DKK	(35)	E5ZE-9F593-AB	Brown
	2.3L OHC Car	ND	(14)	E59E-9F593-AB	Gray
	2.3L OHC Truck	ND	(14)	E59E-9F593-AB	Gray
	2.9L Truck	Bosch	(14)	E7DE-9F593-BB	Gray
	3.0L Car	ND	(14)	E59E-9F593-AB	Gray
	3.0L Truck	ND	(14)	E59E-9F593-AB	Gray
	4.9L Truck	Bosch	(14)	E67E-9F593-BB	Gray
	5.0L Car	Bosch/Ford/ND	(14)	E67E-9F593-BB	Gray
	5.0L HO Car	ND	(19)	E6TE-9F593-AB	Yellowish Orange
	5.0L Truck	Bosch/DKK	(19)	E5TE-9F593-BB/AB	Yellowish Orange
1988	1.9L Car	Bosch	(19)	E6EE-9F593-AB	White
	2.3L T/C Car	DKK	(35)	E5ZE-9F593-AB	Brown
	2.3L Car	ND	(14)	E59E-9F593-AB	Gray
	2.3L HSC Car	Bosch	(14)	*E67E-9F593-BB	Gray
	2.3L Truck	ND	(14)	E59E-9F593-AB	Gray
	2.9L Truck	Bosch	(14)	E7DE-9F593-BB	Gray
	3.0L Car	ND	(14)	E59E-9F593-AB	Gray
	3.0L Truck	ND	(14)	E59E-9F593-AB	Gray
	3.8L Car	ND	(14)	E59E-9F593-AB	Gray
	3.8L Car	Bosch	(14)	E67E-9F593-BB	Gray
	4.9L Truck	Bosch/Ford	(14)	*E67E-9F593-BB	Gray
	5.0L Car	Ford	(14)	E67E-9F593-BB	Gray
	5.0L HO Car	ND/DKK	(19)	E6TE-9F593-AB	Yellowish Orange
	5.0L Truck	Bosch/DKK	(19)	E5TE-9F593-AB	Yellowish Orange
	5.8L Truck	Bosch	(19)	E5TE-9F593-AB	Yellowish Orange
	7.5L Truck	Bosch	(24)	E8TE-9F593-BC	Blue
1989 Same as 1988 Except	2.3L HSC Car	Bosch	(14)	E67E-9F593-BB	Gray
	2.3L HSC Car	ND	(14)	E59E-9F593-AB	Gray
	2.9L Truck	Bosch	(14)	E67E-9F593-BB	Gray
	3.8L Car	Bosch	(14)	E67E-95593-BB	Gray

NOTE: * Means 55 PSI fuel pressure.

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SECTION 5

Catalyst and Exhaust Systems

Contents

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Catalyst and Exhaust Systems

DESCRIPTION

Catalytic Converter System

The engine exhaust consists mainly of Nitrogen (N_2), however, it also contains Carbon Monoxide (CO), Carbon Dioxide (CO_2), Water Vapor (H_2O), Oxygen (O_2), Nitrogen Oxides (NOx), and Hydrogen (H_2) as well as various, unburned Hydrocarbons (HC). Three of these exhaust components — CO, NOx, and HC — are major air pollutants, so their emission to the atmosphere has to be controlled.

The catalytic converter, mounted in the engine exhaust stream, plays a major role in the emission control system. The converter works as a gas reactor, and its catalytic function is to speed up the heat producing chemical reaction between the exhaust gas components in order to reduce the air pollutants in the engine exhaust. The catalyst material, contained inside the converter, is made of a ceramic substrate that is coated with a high surface area alumina and impregnated with catalytically active, precious metals (Figure 1).

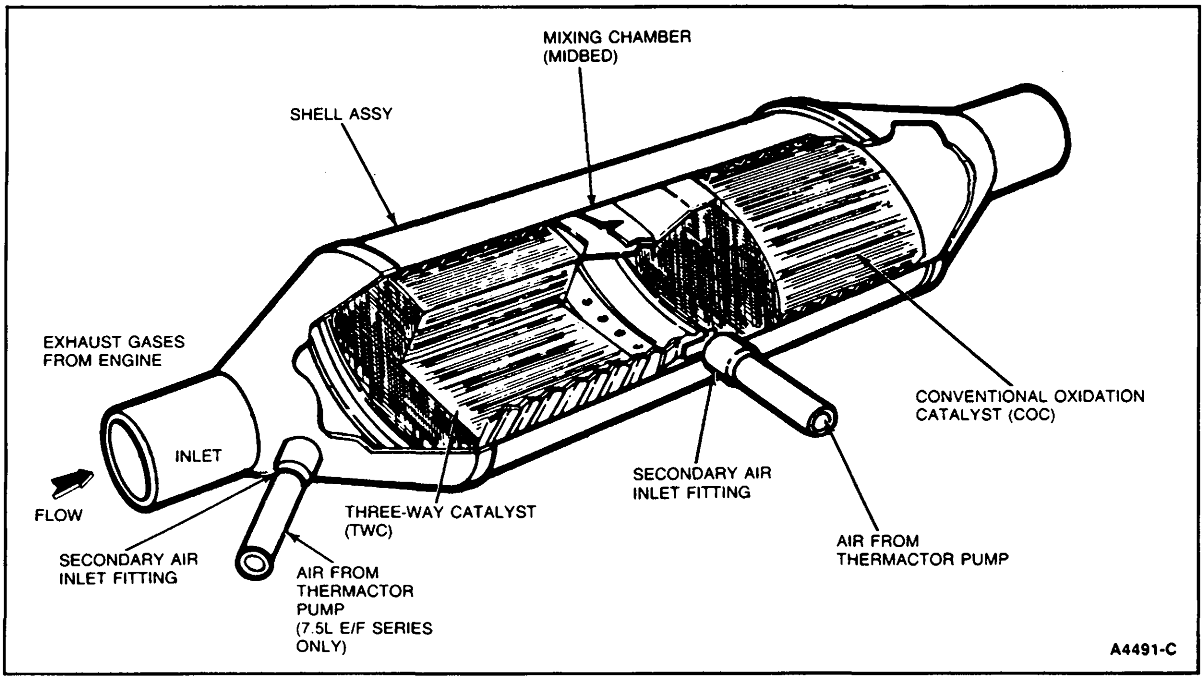

Figure 1 Dual Catalytic Converter

It is the surface of the catalyst material that plays a major role in the heat producing chemical reaction. There are basically three types of catalysts:

1. The conventional oxidation catalyst (COC), containing Platinum (Pt) and Palladium (Pd), is effective for catalyzing the oxidation reactions of HC and CO.

2. The three-way catalyst (TWC), containing Platinum (Pt) and Rhodium (RH) or Palladium (Pd) and Rhodium (RH), is not only effective for catalyzing the oxidation reactions of HC and CO, but it also catalyzes the reduction of NOx.

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Catalyst and Exhaust Systems

3. The Light Off Catalyst (LOC) is a single-bed converter. It is arranged in series with the main catalytic converter assembly of COC and/or TWC as the aft member(s). This converter is designed to perform the very specialized function of exhaust emission control during engine warm-up when the main converter(s) is not yet at the temperature required for maximum efficiency. The LOC is designed to operate effectively in the high temperature environmental conditions that exist near the manifold flange. The LOC was designed with a minimum heat sink effect and; therefore, provides minimum delay in warm-up of the main catalytic converter(s).

The catalytic converter assembly consists of a structured shell containing a monolithic substrate — a ceramic, honeycomb construction. In order to maintain the converter's feed gas (exhaust) oxygen content at a high level to obtain the maximum oxidation for producing the heated chemical reaction, the oxidation catalyst requires the use of a secondary air source, and this is provided by the pulse air or thermactor air injection systems.

The catalytic converter system is protected by several devices that block out the secondary air supply from the thermactor air injection system when the engine is laboring under any abnormal hot or cold operating situation.

Depending on the engine calibration, these block-out devices are functional under one or more of the following conditions:

- Cold engine operation with rich choke mixture.
- Abnormally high engine coolant temperatures above 107°C (225°F), which may result from a condition such as an extended, hot idle on a hot day.
- Wide-open throttle.
- Engine deceleration.
- Extended idle operation.

A complete description of the design and operation of these block-out devices can be found in Thermactor Systems, Section 10.

Exhaust Heat Control Valve

Exhaust Heat Control Valve Bimetal Type

The valve is normally in the closed position, engine cold and not running, to divert exhaust gases to the intake manifold riser pad. When the engine is started, the heat from the exhaust gases actuates the bimetal spring which opens the valve. As operating temperatures are reached, the valve will remain open. The valve, when cold, will also open at high engine speeds, due to the action of the exhaust gas on the unbalanced valve plate.

A. Inspect valve assembly for any abnormal condition. Service or replace as necessary.

B. Lubricate the valve with C0AZ-19A501-A or C4AZ-19A501-A graphite lube or equivalent.

C. Check valve and thermostatic spring operation by manually rotating the valve shaft. Valve must be free and return to the closed position when cold (Rotunda Choke Tester Model 090-00001 or equivalent may be used if necessary to cool bimetal).

Vacuum Operated Heat Control Valve

Refer to Components, Section 3 for description and operation.

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Catalyst and Exhaust Systems

Restricted Exhaust System Diagnosis — Lack of Power or Induction Backfire

A restricted or blocked exhaust system usually results in loss or lack of power or popping through the carburetor. Verify that the condition is not caused by ignition or timing problems, then proceed with diagnosis using the following procedure.

TEST STEP	RESULT ▶	ACTION TO TAKE
B0 VISUAL INSPECTION		
• Visually inspect the exhaust system. • **Is the exhaust system visually OK?**	Yes ▶	GO to B1 .
	No ▶	REPLACE any collapsed exhaust components. If problem is not corrected, GO to B1 .
B1 VACUUM TEST		
• Attach vacuum gauge to intake manifold vacuum source. • Hook up tachometer. • Start engine and gradually increase speed to 2000 rpm with transmission in NEUTRAL. • **Is the manifold vacuum above 16 inches of mercury?**	Yes ▶	No restriction in exhaust system. REFER to Section 2, Diagnostic Routine 209, Lack of Power.
	No ▶	GO to B2 .
B2 VACUUM TEST — EXHAUST DISCONNECTED		
• Turn engine Off. • Disconnect exhaust system at exhaust manifold(s). • **Repeat vacuum test. Is the manifold vacuum above 16 inches of mercury?**	Yes ▶	GO to B3 .
	No ▶	GO to B4 .

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Catalyst and Exhaust Systems

TEST STEP		RESULT ▶	ACTION TO TAKE
B3	VACUUM TEST — CATALYTIC CONVERTER(S) ON/MUFFLER(S) OFF		
• Turn engine Off. • Reconnect exhaust system at exhaust manifold(s). • Disconnect muffler(s). • **Repeat vacuum test. Is the manifold vacuum above 16 inches of mercury?**		Yes ▶	REPLACE muffler(s).
		No ▶	REPLACE catalytic converter and inspect muffler to be sure converter debris has not entered muffler.
B4	EXHAUST MANIFOLD RESTRICTED		
• Remove the exhaust manifold(s). Inspect the ports for casting flash by dropping a length of chain into each port. **Do not use a wire or light to check ports. The restriction may be large enough for them to pass through but small enough to cause excessive back pressure at high engine rpm.** • **Is a restriction present?**		Yes ▶	REMOVE casting flash. If flash cannot be removed, REPLACE exhaust manifold(s).
		No ▶	REFER to Section 2, Diagnostic Routine 209, Lack of Power.

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SECTION 6

Exhaust Gas Recirculation (EGR) Systems

Contents

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System Descriptions

Typical Vacuum Operated EGR System

The Exhaust Gas Recirculation System (EGR) is designed to reintroduce exhaust gas into the combustion cycle lowering combustion temperatures and reducing the formation of Nitrous Oxide.

There are six basic types of EGR systems:

- The Back Pressure Variable Transducer (9J431 + 9D475)
- The Integral Back Pressure Transducer EGR Valve (9D448)
- The Ported EGR Valve (9D475)
- The Electronic EGR Valve (9F483)
- The Valve and Transducer Assembly EGR Valve (9H495)
- The PFE — EGR System (95460 + 9D475)

NOTE: Refer to Section 3 for valve description and function.

The amount of exhaust gas reintroduced and the timing of the cycle varies by calibration and is controlled by various factors such as engine speed, engine vacuum, exhaust system back pressure, coolant temperature and throttle angle depending on the calibration. All EGR valves are vacuum actuated. The vacuum diagram is shown on the emission decal for each calibration.

Typical Pressure Feedback Electronic EGR System

PFE is a subsonic closed loop EGR system that controls EGR flow rate by monitoring the pressure drop across a remotely mounted sharp-edged orifice. The system uses a pressure transducer (-9J460-) as the feedback device and controlled pressure is varied by valve modulation using vacuum output of the EVR solenoid (-9J459-). With PFE system, the EGR valve only serves as a pressure regulator rather than a flow metering device.

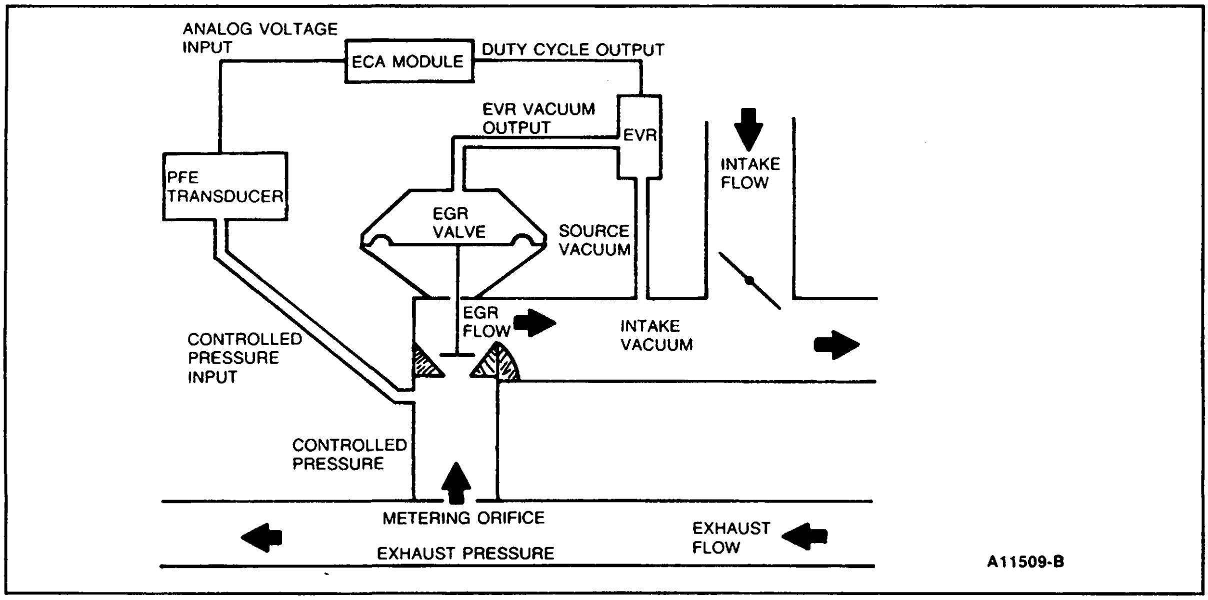

Figure 1 Typical Pressure Feedback Electronic EGR System

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System Descriptions

Typical Back Pressure Variable Transducer (BVT) System

The BVT system is used on 1.9L EFI H.O. passenger car applications. A typical BVT control system is shown in Figure 2. It consists of three components; a vacuum regulator (9J431), EGR valve (9D475) and a flow control orifice.

The regulator modulates the vacuum signal to the EGR valve using two back pressure inputs. One input is the standard vehicle back pressure and the other is the back pressure downstream of the flow control orifice. The control chamber pickup is in the EGR tube and the flow control orifice is integral with the upstream EGR tube connector.

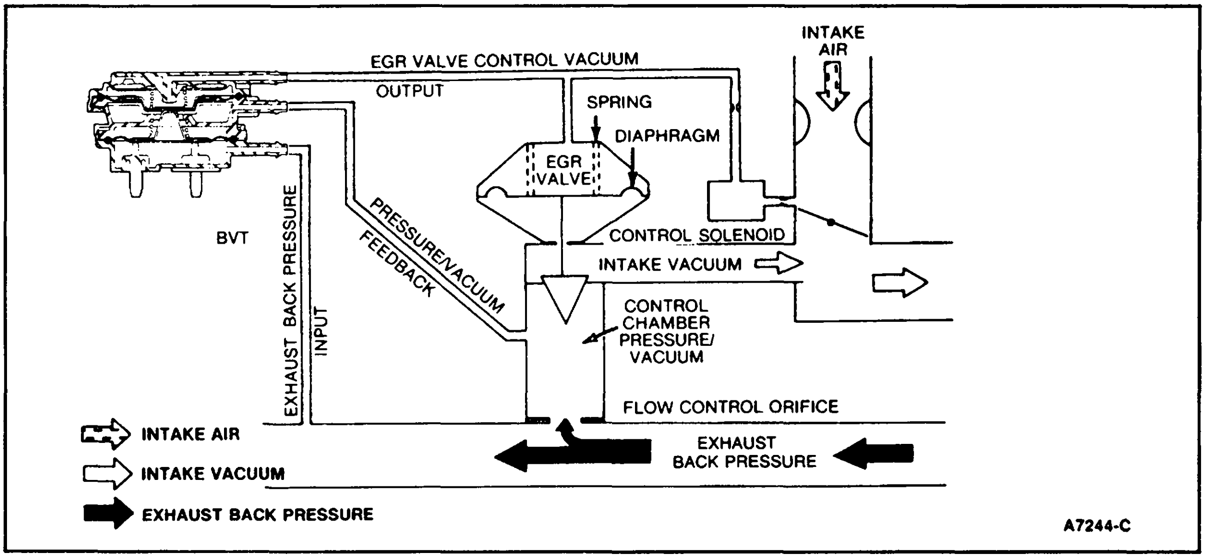

Figure 2 Back Pressure Variable Transducer (BVT) Schematic Diagram

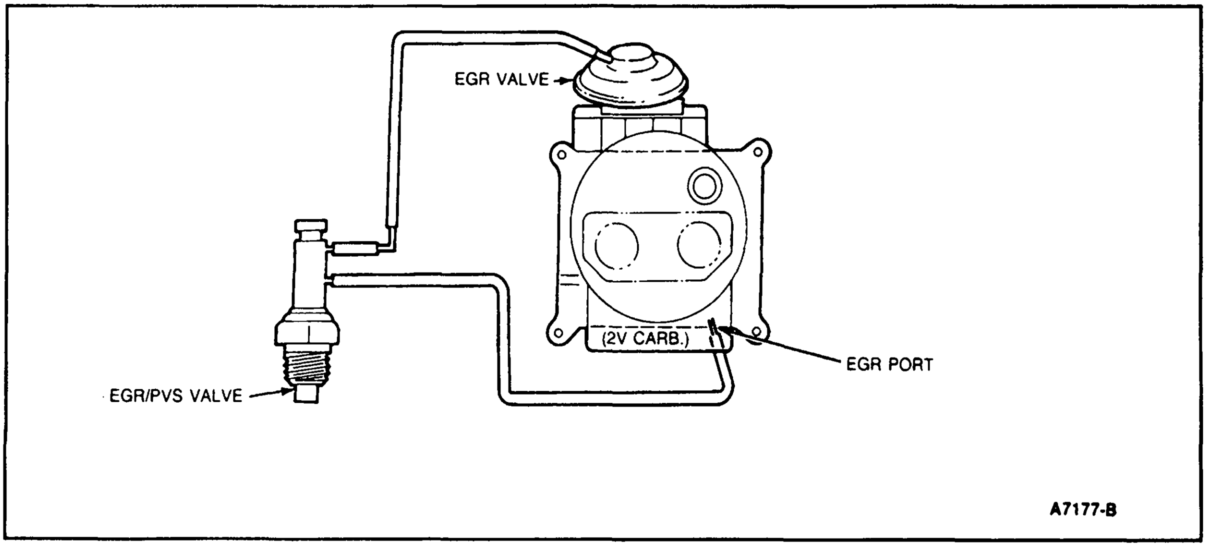

Figure 3 Typical EGR Vacuum System — 5.8L Carbureted System (Non-Electronic)

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Diagnosis By Symptom

SYMPTOM	POSSIBLE SOURCE	ACTION
• Rough Idle Cold	• EGR valve malfunction.	• Run EEC-IV Quick Test. Refer to Section 14.
	• BVT malfunction.	• Perform BVT diagnosis.
	• EGR flange gasket leaking.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve attaching nuts or bolts loose or missing.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR, VCV or TVS malfunction.	• Perform EGR, VCV or TVS diagnosis, refer to Section 3.
	• Load control (WOT) valve malfunction.	• Perform load control (WOT) valve diagnosis.
	• Vacuum leak at EVP sensor.	• Replace O-ring seal and tighten EVP sensor attaching nuts to specification.
	• EGR valve contamination.	• Clean EGR valve.
	• Curb idle speed too high or low.	• Reset according to Section 4.
• Rough Idle Hot	• EGR valve malfunction.	• Run EEC-IV Quick Test. Refer to Section 14.
	• BVT malfunction.	• Perform BVT diagnosis.
	• EGR flange gasket leaking.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve attaching nuts or bolts loose or missing.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• Load control (WOT) valve malfunction.	• Perform load control (WOT) valve diagnosis, refer to Section 3.
	• Vacuum leak at EVP sensor.	• Replace O-ring seal and tighten EVP sensor attaching nuts to specification.
	• EGR valve contamination.	• Clean EGR valve.
	• Curb idle speed too high or low.	• Reset according to Section 4.

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Diagnosis By Symptom

SYMPTOM	POSSIBLE SOURCE	ACTION
• Rough Running, Surge, Hesitation, Poor Part Throttle Performance —Cold	• EGR valve malfunction.	• Perform EGR valve diagnosis.
	• BVT malfunction.	• Perform BVT diagnosis.
	• EGR flange gasket leaking.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve attaching nuts or bolts loose or missing.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR solenoid malfunction.	• Run EEC-IV Quick Test. Refer to Section 14.
	• EGR, VCV or TVS malfunction.	• Perform EGR, VCV or TVS diagnosis, refer to Section 3.
	• Load control (WOT) valve malfunction.	• Perform load control (WOT) valve diagnosis, refer to Section 3.
	• Vacuum leak at EVP sensor.	• Replace O-ring seal and tighten EVP sensor attaching nuts to specification.
	• EGR valve contamination.	• Clean EGR valve.
	• Ignition timing too low.	• Reset to specification shown on emission decal.
• Rough Running, Surge, Hesitation, Poor Part Throttle Performance —Hot	• EGR valve malfunction.	• Perform EGR valve diagnosis.
	• BVT malfunction.	• Perform BVT diagnosis.
	• EGR flange gasket leaking.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve attaching nuts or bolts loose or missing.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR, VCV or TVS malfunction.	• Perform EGR, VCV or TVS diagnosis, refer to Section 3.
	• EGR valve contamination.	• Clean EGR valve and if necessary, replace EGR valve.
	• Load control (WOT) valve malfunction.	• Perform load control (WOT) valve diagnosis, refer to Section 3.
	• Vacuum leak at EVP sensor.	• Replace O-ring seal and tighten EVP sensor attaching nuts to specification.
	• Insufficient exhaust back pressure to activate valve.	• Check exhaust system for leaks.
	• Ignition timing too low.	• Reset to specification shown on emission decal.

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Diagnosis By Symptom

SYMPTOM	POSSIBLE SOURCE	ACTION
• Engine Stalls On Deceleration — Hot and Cold	• EGR valve malfunction.	• Perform EGR valve diagnosis.
	• BVT malfunction.	• Perform BVT functional test.
	• EGR flange gasket leaking.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve attaching nuts or bolts loose or missing.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR solenoid malfunction.	• Run EEC-IV Quick Test. Refer to Section 14.
	• EGR, VCV or TVS malfunction.	• Perform EGR, VCV or TVS diagnosis, refer to Section 3.
	• EGR valve contamination.	• Clean EGR valve and if necessary, replace EGR valve.
	• Load control (WOT) valve malfunction.	• Perform load control (WOT) valve diagnosis, referto Section 3.
	• Curb idle speed too low.	• Reset according to Section 4.
	• Ignition timing too low.	• Reset to specification shown on emission decal.

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Diagnosis By Symptom

SYMPTOM	POSSIBLE SOURCE	ACTION
• Engine Spark Knock or Ping	• EGR malfunction.	• Perform EGR valve diagnosis.
	• BVT malfunction.	• Perform BVT diagnosis.
	• EGR flange gasket leaking.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve attaching nuts or bolts loose or missing.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR solenoid malfunction.	• Run EEC-IV Quick Test. Refer to Section 14.
	• EGR, VCV or TVS malfunction.	• Perform EGR, VCV or TVS diagnosis, refer to Section 3.
	• Blocked or restricted passages in valve or spacer.	• Clean passages in EGR spacer and EGR valve.
	• Vacuum leak at EVP sensor.	• Replace O-ring seal and tighten EVP sensor attaching nuts to specification.
	• Insufficient exhaust back pressure to actuate valve.	• Check exhaust system for leaks.
	• Ignition timing too high.	• Reset to specification shown on emission decal.
	• Air cleaner temperature vacuum switch (TVS) malfunction.	• Perform air cleaner temperature switch (TVS) diagnosis, refer to Section 3.
• Engine Stalls At Idle — Cold	• EGR valve malfunction.	• Perform EGR valve diagnosis.
	• BVT malfunction.	• Perform BVT diagnosis.
	• EGR flange gasket leaking.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve attaching nuts or bolts loose or missing.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR solenoid malfunction.	• Run EEC-IV Quick Test. Refer to Section 14.
	• EGR, PVS or TVS malfunction.	• Perform EGR, PVS or TVS diagnosis, refer to Section 3.
	• EGR valve contamination.	• Clean EGR valve.
	• Load control (WOT) valve malfunction.	• Perform load control (WOT) valve diagnosis, refer to Section 3.
	• Curb idle speed too low.	• Reset according to Section 4.
	• Ignition timing too low.	• Reset to specification shown on emission decal.

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Diagnosis By Symptom

SYMPTOM	POSSIBLE SOURCE	ACTION
• Engine Stalls At Idle — Hot	• EGR valve malfunction.	• Perform EGR valve diagnosis.
	• BVT malfunction.	• Perform BVT diagnosis.
	• EGR flange gasket leaking.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve attaching nuts or bolts loose or missing.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve contamination.	• Clean EGR valve and if necessary, replace EGR valve.
	• Load control (WOT) valve malfunction.	• Perform load control (WOT) valve diagnosis, refer to Section 3.
		• Replace O-ring seal and tighten EVP sensor attaching nuts to specification.
	• EGR solenoid malfunction.	• Run EEC-IV Quick Test. Refer to Section 14.
	• Curb idle speed too high or low.	• Reset according to Section 4.
	• Ignition timing too low.	• Reset to specification shown on emission decal.
• Low Power at Wide-Open Throttle	• EGR valve malfunction.	• Perform EGR valve diagnosis.
	• BVT malfunction.	• Perform BVT diagnosis.
	• EGR flange gasket leaking.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve attaching nuts or bolts loose or missing.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• Load control (WOT) valve malfunction.	• Perform load control (WOT) valve diagnosis, refer to Section 3.
	• EGR solenoid malfunction.	• Run EEC-IV Quick Test. Refer to Section 14.
	• Ignition timing too low.	• Reset to specification shown on emission decal.

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Diagnosis By Symptom

SYMPTOM	POSSIBLE SOURCE	ACTION
• Engine Starts But Will Not Run —Engine Hard To Start Or Will Not Start	• EGR valve malfunction.	• Perform EGR valve diagnosis.
	• BVT malfunction.	• Perform BVT diagnosis.
	• EGR flange gasket leaking.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve attaching nuts or bolts loose or missing.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR solenoid malfunction.	• Run EEC-IV Quick Test. Refer to Section 14.
	• EGR, VCV or TVS malfunction.	• Perform EGR, VCV or TVS diagnosis, refer to Section 3.
	• EGR valve contamination.	• Clean EGR valve.
	• Vacuum leak at EVP sensor.	• Replace O-ring seal and tighten EVP sensor attaching nuts to specification.
• Poor Fuel Economy	• EGR valve malfunction.	• Perform EGR valve diagnosis.
	• BVT malfunction.	• Perform BVT diagnosis.
	• EGR flange gasket leaking.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve attaching nuts or bolts loose or missing.	• Replace flange gasket and tighten attaching nuts or bolts to specification.
	• EGR solenoid malfunction.	• Run EEC-IV Quick Test. Refer to Section 14.
	• EGR, PVS or TVS malfunction.	• Perform EGR, PVS or TVS diagnosis, refer to Section 3.
	• Blocked or restricted EGR passages in valve or spacer.	• Clean passages in EGR spacer and replace EGR valve.
	• Load control (WOT) valve malfunction.	• Perform load control (WOT) valve diagnosis, refer to Section 3.
	• Vacuum leak at EVP sensor.	• Replace O-ring seal and tighten EVP sensor attaching nuts to specification.
	• Insufficient exhaust back pressure to activate valve.	• Check exhaust system for leaks.
	• Ignition timing too low.	• Reset to specification shown on emission decal.

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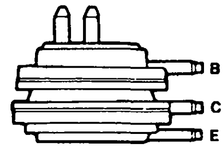
Functional Diagnosis

BACK PRESSURE VARIABLE TRANSDUCER (BVT) SYSTEM



9J431

1. Make certain that all vacuum hoses are correctly routed and securely attached. Replace cracked, crimped or broken hoses.
2. Make certain there is no vacuum to the EGR valve at idle with the engine at normal operating temperature.
3. Install a tachometer, Rotunda 059-00010 or equivalent.
4. Disconnect the Idle Air Bypass Valve (9F715) electrical connector (EFI engines only).
5. Remove vacuum supply hose from the EGR valve nipple. Plug the hose.
6. Start engine, idle with transmission in NEUTRAL, and observe the engine idle speed. If necessary, adjust idle speed according to Section 4.
7. Slowly apply 5-10 inches of mercury vacuum to the EGR valve vacuum nipple using a hand vacuum pump, Rotunda 021-00014 or equivalent.
8. When vacuum is fully applied to the EGR valve:
   - If idle speed drops more than 100 rpm or if engine stalls, perform the next step. Otherwise, for vacuum leak at EGR valve, replace the valve.
   - If EGR passages are blocked, clean the EGR valve using (Rotunda) 021-80056 EGR valve cleaner or equivalent.
   - Remove the vacuum from the EGR valve. If idle speed does not return to normal (±25 rpm), check for contamination, clean the valve.
   - If symptom still exists, replace the EGR valve.
9. Reconnect the idle air bypass valve electrical connector.
10. Unplug and reconnect the EGR vacuum supply hose.
11. Disconnect the vacuum connection at the 9J431 Back Pressure Variable Transducer (BVT).
12. Gently blow into the hose to Port C until the relief valve closes and at the same time apply 5-10 inches of mercury vacuum to Port E with a hand vacuum pump. Port E should hold vacuum as long as there is pressure on Port C.
13. Apply a minimum of 5-10 inches of mercury vacuum to Ports B and C using a hand vacuum pump. Ports B and C should hold vacuum.
14. Replace the BVT if any of the Ports do not hold vacuum.
15. Reconnect the vacuum at the BVT.
16. If neither the EGR valve nor the BVT were replaced, the system is OK. Refer to the Diagnostic Routine in Section 2.

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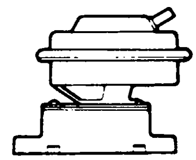
Functional Diagnosis

INTEGRAL BACK PRESSURE (IBP) TRANSDUCER EGR VALVE



9D448

WARNING

DO NOT USE ROTUNDA EGR CLEANER (021-80056) ON THIS VALVE.

1. Make certain that all vacuum hoses are correctly routed and securely attached. Replace cracked, crimped or broken hoses.
2. Make certain there is no vacuum to the EGR valve at idle with the engine at normal operating temperature.
3. Install a tachometer, Rotunda 059-00010 or equivalent.
4. Plug the tailpipe(s) to increase the exhaust system back pressure, leaving a 1/2-inch diameter opening to allow exhaust gases to escape.
5. Remove the vacuum supply hose from the EGR valve nipple. Plug the hose.
6. Start engine, idle with transmission in NEUTRAL, and observe idle speed. If necessary, adjust idle speed according to Section 4.
7. Slowly apply 5-10 inches of mercury vacuum to the EGR valve vacuum nipple using a hand vacuum pump, Rotunda 021-00014 or equivalent.
8. When vacuum is applied to the EGR valve and any of the following occur, replace the valve:
   - Engine does not stall
   - Idle speed does not drop more than 100 rpm
   - Idle speed does not return to normal (±25 rpm) after the vacuum is removed
9. If the EGR valve is not replaced, reconnect the idle air bypass valve electrical connector.
10. Unplug and reconnect the EGR vacuum supply hose.
11. Remove the tailpipe plug(s).
12. The EGR system is OK, refer to the Diagnostic Routines in Section 2.

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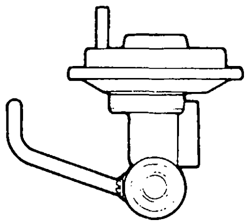
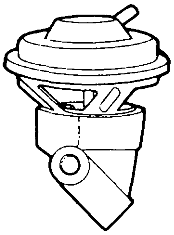
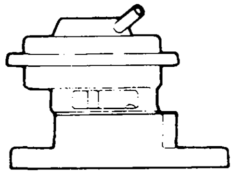
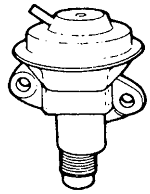
Functional Diagnosis

PORTED EGR VALVE	 **9D460**	 **9D475**	 **9D475**	 **9D475**

1. Make certain that all vacuum hoses are correctly routed and securely attached. Replace cracked, crimped or broken hoses.
2. Make certain there is no vacuum to the EGR valve at idle with the engine at normal operating temperature.
3. Install a tachometer, Rotunda 059-00010 or equivalent.
4. Disconnect the Idle Air Bypass Valve (9F715) electrical connector (EFI engines only).
5. Remove the vacuum supply hose from the EGR valve nipple. Plug the hose.
6. Start engine, idle with transmission in NEUTRAL, and observe the engine idle speed. If necessary, adjust idle speed according to Section 4.
7. Slowly apply 5-10 inches of mercury vacuum to the EGR valve vacuum nipple using a hand vacuum pump, Rotunda 021-00014 or equivalent.
8. When vacuum is fully applied to the EGR valve:
   - If idle speed drops more than 100 rpm or if engine stalls, perform the next step. Otherwise, for vacuum leak at EGR valve, replace the valve.
   - If EGR passages are blocked, clean the valve using Rotunda 021-80056 EGR valve cleaner.
   - Remove the vacuum from the EGR valve. If idle speed does not return to normal (±25 rpm), check for contamination, clean the valve.
   - Make sure there is no sand left in the valve or pick-up tube. Replace the valve if necessary.
9. Reconnect the idle air bypass valve electrical connector.
10. Unplug and reconnect the EGR vacuum supply hose.
11. The EGR system is OK, refer to the Diagnostic Routines in Section 2.

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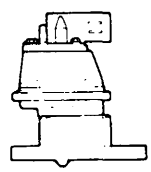
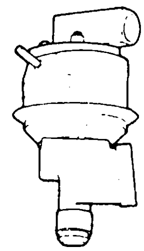
Functional Diagnosis

ELECTRONIC EGR (EEGR) VALVE



9F483



9F483

1. Make certain that all vacuum hoses are correctly routed and securely attached. Replace cracked, crimped or broken hoses.
2. Make certain there is less than 2.5 in-Hg vacuum to the EGR valve at idle with the engine at normal operating temperature.

   NOTE: The EVR solenoid has a constant internal leak. You will notice a small vacuum signal. This signal should be less than 1.0 in-Hg at idle.
3. Install a tachometer, Rotunda 059-00010 or equivalent.
4. Disconnect the Idle Air Bypass Valve (9F715) electrical connector (1.9L EFI engines only).
5. Remove the vacuum supply hose from the EGR valve nipple. Plug the hose.
6. Start engine, idle with transmission in NEUTRAL, and observe the engine idle speed. If necessary, adjust idle speed according to Section 4.
7. Slowly apply 5-10 inches of mercury vacuum to the EGR valve vacuum nipple using a hand vacuum pump, Rotunda 021-00014 or equivalent.
8. When vacuum is applied to the EGR valve and any of the following occur:
   - Engine does not stall
   - Idle speed does not drop more than 100 rpm
   - Idle speed does not return to normal (±25 rpm) after the vacuum is removed

   Then:
   - For vacuum leak at EGR valve, replace the valve.
   - Check for contamination, clean the EGR valve, using Rotunda 021-80056 EGR valve cleaner or equivalent.
   - Make sure there is no sand left in the valve.
   - Replace the EGR valve if necessary.
9. Reconnect the idle air bypass valve electrical connector. Unplug and reconnect the EGR vacuum supply hose.
10. If EGR system is OK, refer to the Diagnostic Routines in Section 2.

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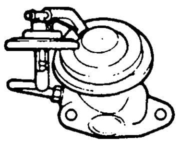
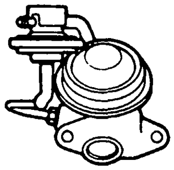
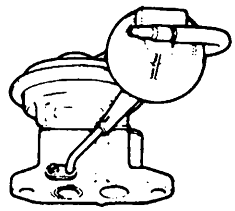
Functional Diagnosis

VALVE AND TRANSDUCER ASSEMBLY	 **9H495**	 **9H495**	 **9H495**

1. Make certain that all vacuum hoses are correctly routed and securely attached. Replace cracked, crimped or broken hoses.
2. Make certain there is no vacuum to the EGR valve at idle with the engine at normal operating temperature.
3. Install a tachometer, Rotunda 059-00010 or equivalent.
4. Plug the tailpipe(s) to increase the exhaust system back pressure, leaving a 1/2-inch diameter opening to allow exhaust gases to escape.
5. Remove the vacuum supply hose from the exhaust back pressure transducer nipple and plug the hose. Do not disconnect the transducer from the EGR valve.
6. Start engine, idle with transmission in NEUTRAL, and observe the engine idle speed. If necessary, adjust idle speed according to Section 4.
7. Slowly apply 5-10 inches of mercury vacuum to the Back Pressure Transducer vacuum nipple using a hand vacuum pump, Rotunda 021-00014 or equivalent.
8. When vacuum is applied to the Back Pressure Transducer and any of the following occur:
   - Engine does not stall
   - Idle speed does not drop more than 100 rpm
   - Idle speed does not return to normal (±25 rpm) after the vacuum is removed

   Then:

   - Check for contamination.
   - Disconnect the transducer from the pick-up tube and clean the valve using Rotunda 021-80056 EGR valve cleaner or equivalent.
   - Make sure no sand (grit) is in the valve or pick-up tube.
   - If symptom still exists, replace EGR valve.
   - If there is a vacuum leak at the EGR valve, replace the valve.
9. Reconnect the vacuum supply hose to the exhaust back pressure transducer, remove the tailpipe plug(s).
10. If EGR system is OK, refer to the Diagnostic Routines in Section 2.

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Functional Diagnosis

ROTUNDA EQUIPMENT

Model	Description
021-00014	Vacuum Pump
059-00010	Tachometer
021-80056	EGR Valve Cleaner

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SECTION 7

Evaporative Emission Systems

Contents

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Evaporative Emission Systems

DESCRIPTION

Typical Air Cleaner Purge Evaporative Emission System

Fuel Tank Venting

Fuel vapors trapped in the sealed fuel tank are vented through the orificed vapor valve assembly in the top of the tank. The vapors leave the valve assembly through a single vapor line and continue to the carbon canister (located in the engine compartment or along the frame rail), for storage, until they are purged to the engine for burning.

Carburetor Venting

If the engine is equipped with a carburetor, the vapors from the fuel bowl are vented to the carbon canister by a second tube to the carbon canister.

NOTE: To ensure efficient flow of vapors, the line from the carburetor bowl should have a continuous downhill slope to the canister.

Canister Purging

Purging the carbon canister removes the fuel vapor stored in the carbon canister. With an air cleaner purge system, vapors flow from the carbon canister to the air cleaner and into the engine.

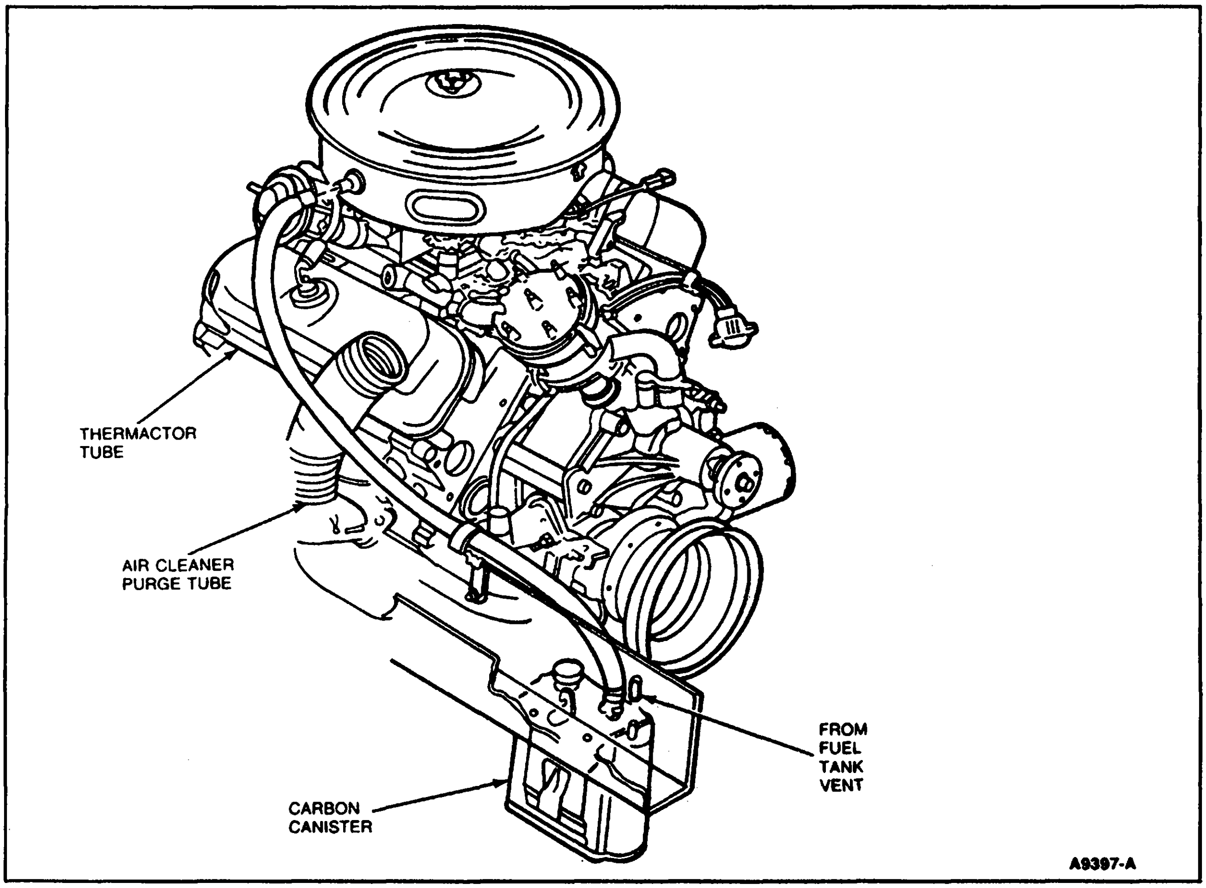

Figure 1 Typical Air Cleaner Purge Evaporative Emission System

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Evaporative Emission Systems

Typical Carbureted Engine Purge System

Fuel Tank Venting

Fuel vapors trapped in the sealed fuel tank are vented through the orificed vapor valve assembly in the top of the tank. The vapors leave the valve assembly through a single vapor line and continue to the carbon canister (located in the engine compartment or along the frame rail), for storage, until they are purged to the engine for burning.

Carburetor Venting

Carburetor vapors from the fuel bowl are vented to the carbon canister. The flow is controlled by a fuel bowl solenoid vent, thermal vent valve, or vacuum thermal bowl vent valve located in the carburetor bowl vent line.

NOTE: To ensure efficient flow of vapors, the line from the carburetor bowl should have a continuous downhill slope to the canister.

Canister Purging

Purging the carbon canister removes the fuel vapor stored in the carbon canister. The flow of vapors from the canister to the engine is controlled by a purge solenoid or a vacuum controlled purge valve. Purging occurs when the engine is at operating temperature and off idle.

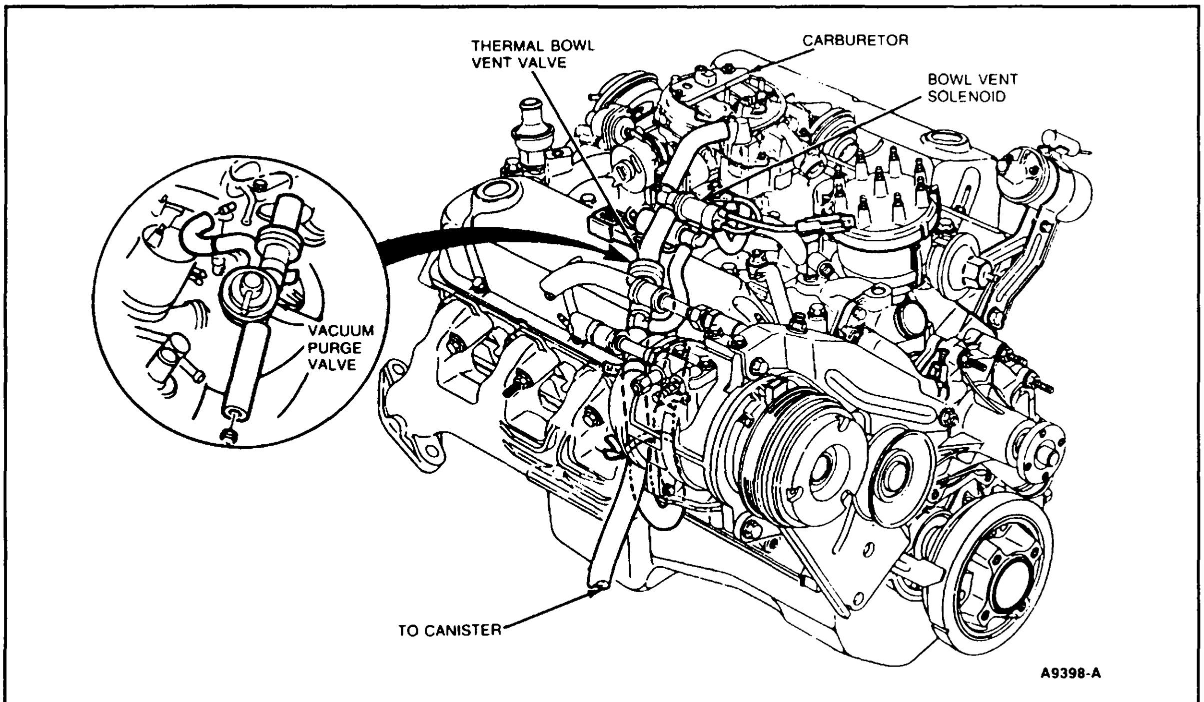

Figure 2 Typical Purge Evaporative Emission for Carbureted Engines

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Evaporative Emission Systems

Typical EEC-IV Purge System (CFI and EFI)

Fuel Tank Venting

Fuel vapors trapped in the sealed fuel tank are vented through the orificed vapor valve assembly in the top of the tank. The vapors leave the valve assembly through a single vapor line and continue to the carbon canister (located in the engine compartment or along the frame rail), for storage, until they are purged to the engine for burning.

Canister Purging

Purging the carbon canister removes the fuel vapor stored in the carbon canister. With an EEC controlled purge system, the flow of vapors from the canister to the engine is controlled by a purge solenoid or vacuum controlled purge valve. Purging occurs when the engine is at operating temperature and off idle.

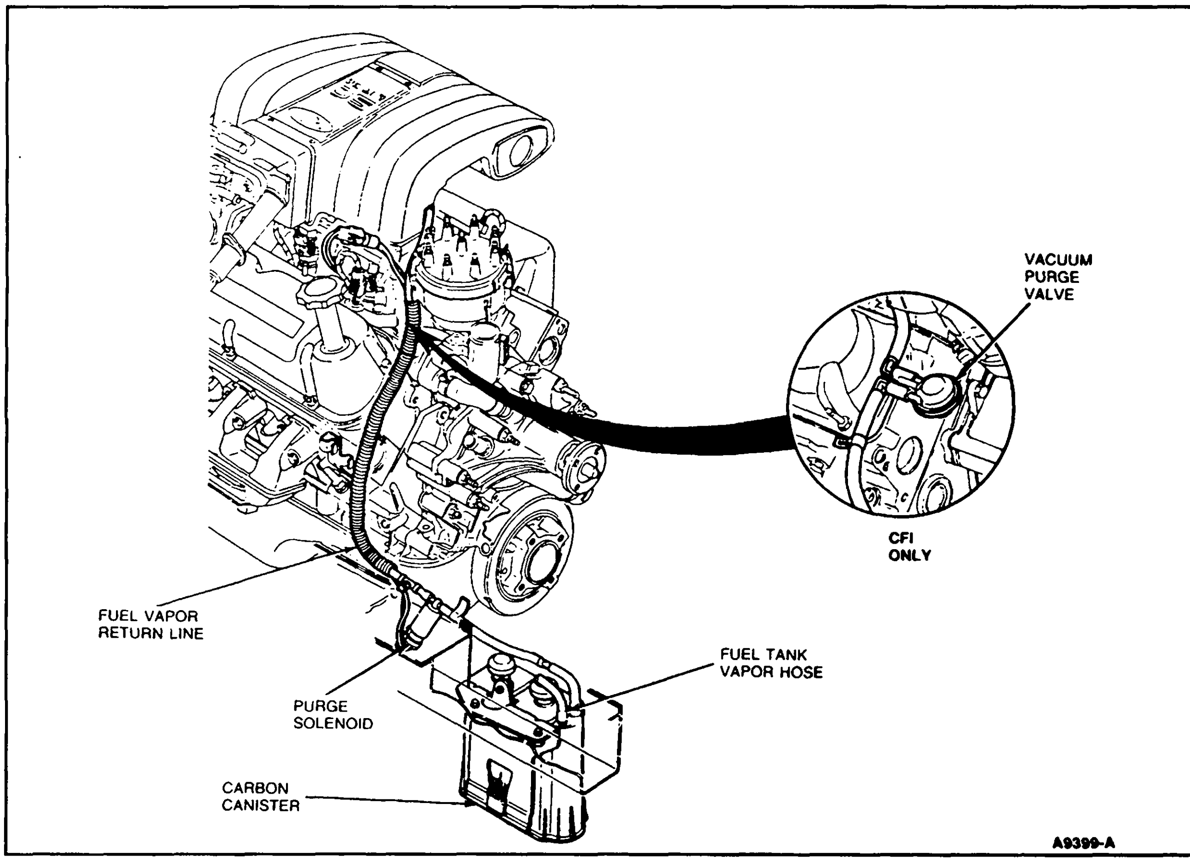

Figure 3 Typical EEC-IV Purge Evaporative Emission System — CFI and EFI

Figure 5 Typical EEC-IV Ported Purge Evaporative Emission System — EFI

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Evaporative Emission Systems

Evaporative Emission Systems

DIAGNOSIS

CONDITION	POSSIBLE SOURCE	ACTION
o Cranks Normally But Slow to Start	o Thermostatic Bowl Vent Valve or Carburetor Fuel Bowl Thermal Vent Valve malfunction.	o Perform Diagnosis. Refer to Section 3.
o Rough Idle	• Thermostatic or Vacuum Bowl Vent Valve open or leaking. o Canister Purge Regulator Valve open. o Carburetor Fuel Bowl Solenoid Vent Valve open. o Canister Purge Valve open or leaking.	o Perform Diagnosis. Refer to Section 3. o Perform Diagnosis. Refer to Section 3. o Perform Diagnosis. Refer to Section 3. o Perform Diagnosis. Refer to Section 3.
o Surge at Steady Speed	o Liquid fuel in Carbon Canister.	o Replace carbon canister. Check fuel tank vent system and carburetor for malfunction.
o Gas Smell	o Thermostatic Bowl Vent Valve or Carburetor Fuel Bowl Thermal Vent Valve malfunction. o Blockage of Carburetor Bowl Vent line. o Canister Purge Regulator Valve or Canister Purge Valve malfunction. o Carburetor Fuel Bowl Solenoid Vent Valve malfunction. o Liquid fuel in Carbon Canister. o Fuel Tank Vent System blocked. o Hole or cut in Carburetor Bowl Vent Line or Fuel Tank Vent Line.	o Perform Diagnosis. Refer to Section 3. o Check line for blockage and route with downhill stop to canister. o Perform Diagnosis. Refer to Section 3. o Perform Diagnosis. Refer to Section 3. o Replace Canister. Check fuel tank vent system and carburetor for malfunction. o Check fuel tank vent system. o Visually inspect and replace damaged line.

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SECTION 8

Inlet Air Temperature Systems

Contents

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Inlet Air Temperature Systems

DESCRIPTION

All passenger cars and light truck engines are equipped with dry-type air cleaners incorporating a replaceable air filter element. Some air inlet systems use air cleaner assemblies with various sensors, switches and vacuum motors to control inlet air temperature. In addition, there are sometimes different sensors present in the air cleaner for other engine control systems.

Some air inlet systems derive the air from a cool air source only, while the rest regulate the air inlet temperature by utilizing air from a cool air source as well as heated air from a heat shroud which is mounted on the exhaust manifold. The duct and valve system which regulates the air flow from these two sources is located either inside the air cleaner, mounted on the air cleaner or in one of the remote mounted inlet tubes. The flow is regulated by means of a door that is operated by a vacuum motor. Operation of the motor is controlled by delay valves, temperature sensors and other vacuum control systems. All vary with each application and engine calibration.

Diagnostic Check

Vacuum Operated Duct Systems

The primary purpose of the duct system is to provide maximum warm air available from the heat shroud to the intake system, and then after vehicle is warm, maintain a temperature in the 70°F to 105°F range by proportioning the warm and fresh air mixture. The functional check of this system should be performed on the vehicle in an ambient temperature of not less than 60°F (15.3°C):

1. Apply parking brake and block wheels.
2. Inspect the heat riser tube for proper installation and/or damage. Service as required.
3. Remove components as necessary to ensure that the duct door is in the open to fresh air position. If door is in the closed to fresh air position, check for binding and sticking. Service or replace as required.
4. Check vacuum source and integrity of vacuum hoses to bimetal sensor, CWM and vacuum motor.
5. Start the engine. If the duct door has moved to the "heat on" position (closed to fresh air) go to Step 6. If door stays in "heat off" position (closed to warm air), place a finger over bleed of bimetal sensor. Duct door must move rapidly to the "heat on" position. If the door does not fully move to "heat on" position, stop engine and replace vacuum motor. Repeat this Step with new vacuum motor.
6. With engine off, cool bimetal sensor and cold weather modulator (CWM) if so equipped, by spraying with liquid from a small can of refrigerant R-12 with an adapter ZRE-6271 or equivalent, for 20 seconds after liquid contact sensor and CWM.

   NOTE: If vehicle is equipped with a delay valve before the vacuum motor, remove for this test and place double nipple in its place.

CAUTION

Do not cool bimetal sensor while the engine is running. If refrigerant R-12 is drawn into the intake system while the engine is running, poisonous phosgene gas will be exhausted into the test area. Perform this test only in a well-ventilated area.

Restart engine. Duct door should move to the "heat on" position. If door does not move or moves only partially, replace sensor. Cool CWM and bimetal sensor.

7. Start and run engine briefly (less than 15 seconds). Duct door should move to "heat on" position.

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Inlet Air Temperature Systems

8. Shut off engine and observe duct door:

   A. Vehicles without CWM: Valve will return slowly to "heat off" position (10 to 30 seconds).

   B. Vehicles with CWM: Valve will stay in "heat on" position for at least 2 minutes. If less than 2 minutes replace CWM and repeat this Step after cooling CWM and bimetal sensor.

The following are schematic representations of some 1989 Passenger Car and Truck inlet air systems:

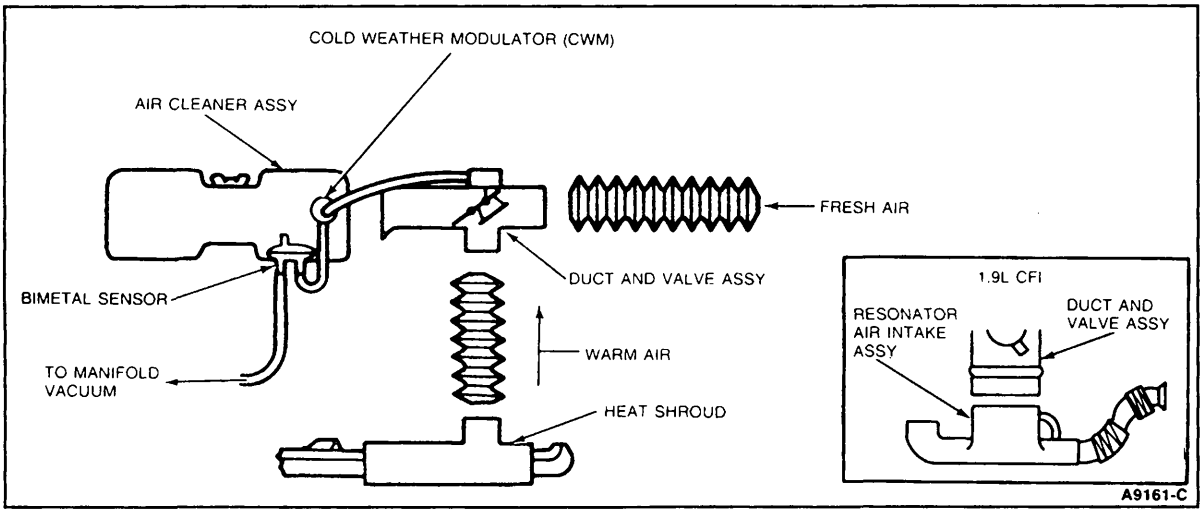

Figure 1 Typical Air Cleaner and Duct System, Carburetor and Throttle Body Applications — 1.9L, CFI, 5.8L (Passenger Car)

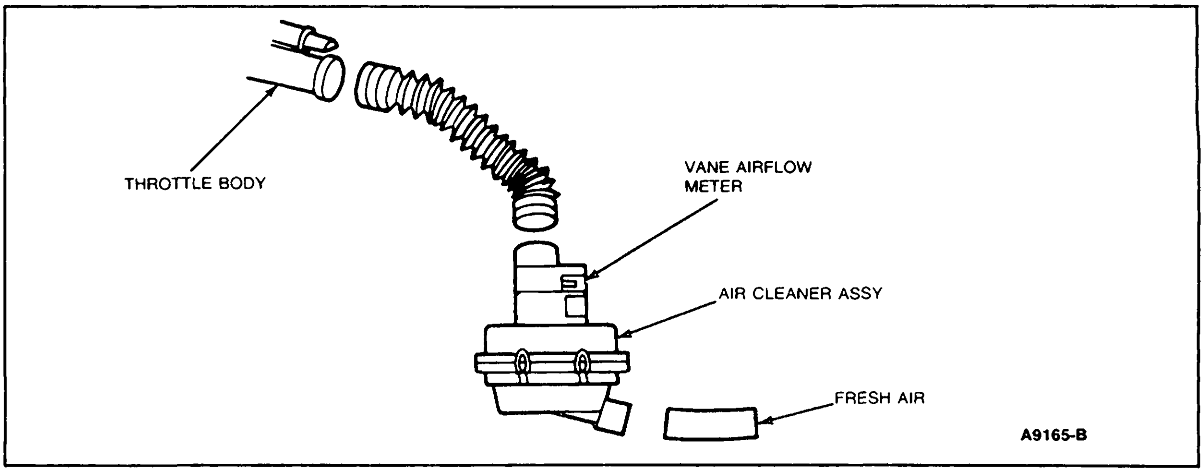

Figure 2 Typical Air Cleaner System — 1.9L EFI (Passenger Car)

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Inlet Air Temperature Systems

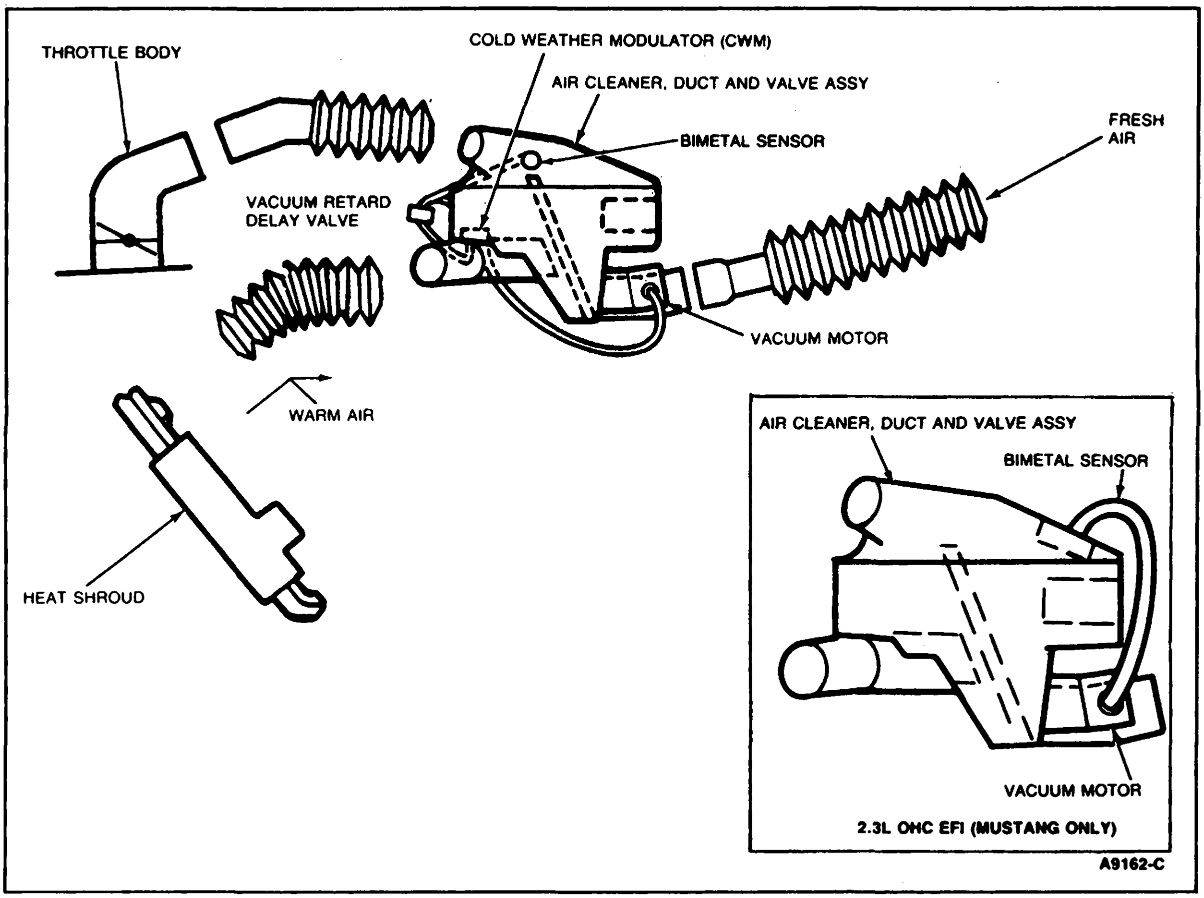

Figure 3 Typical Air Cleaner System — 2.3L EFI HSC (Tempo/Topaz) and 2.3L OHC (Mustang)

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Inlet Air Temperature Systems

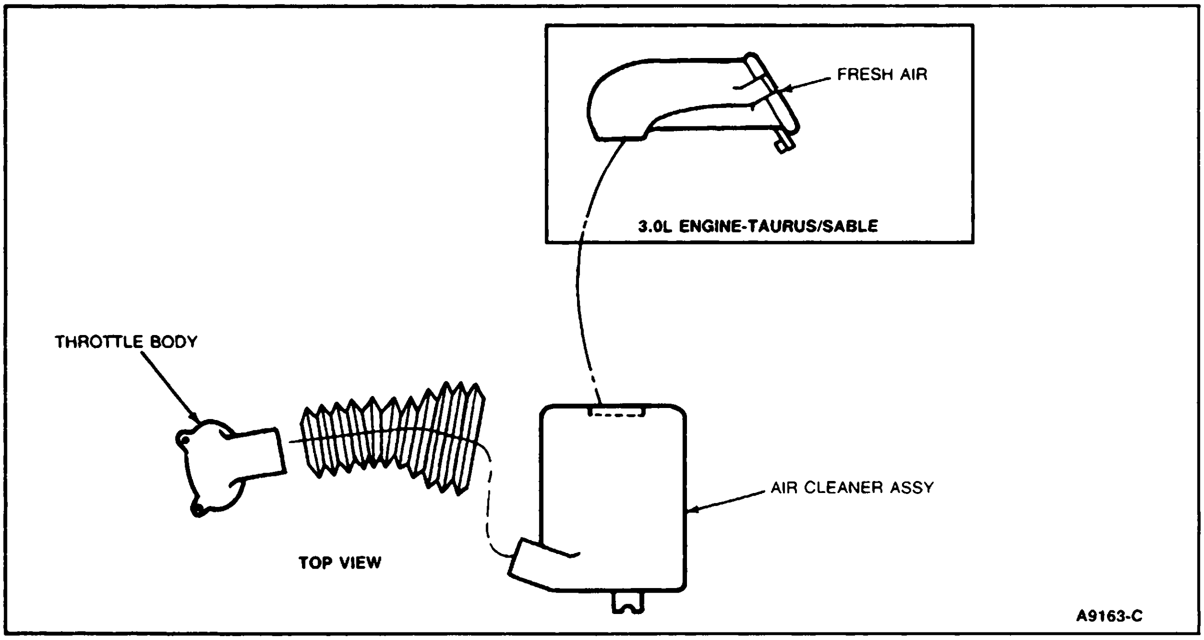

Figure 4 Typical Air Cleaner System — 3.0L EFI (Taurus/Sable)

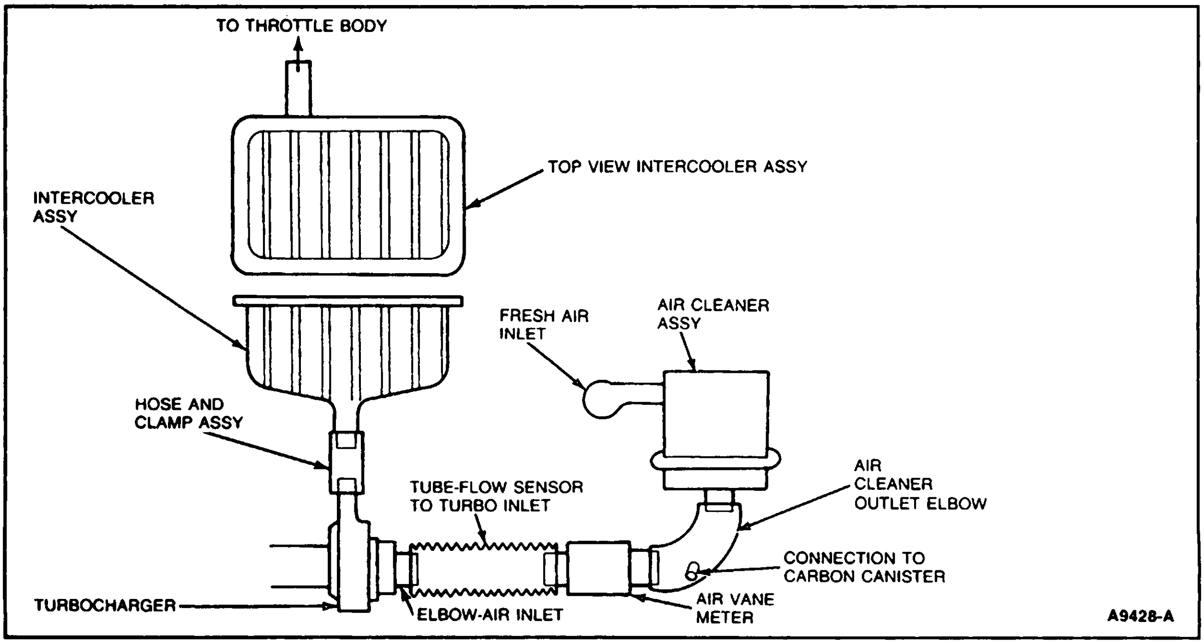

Figure 5 Typical Air Cleaner System — 2.3L EFI OHC Turbo (Thunderbird)

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Inlet Air Temperature Systems

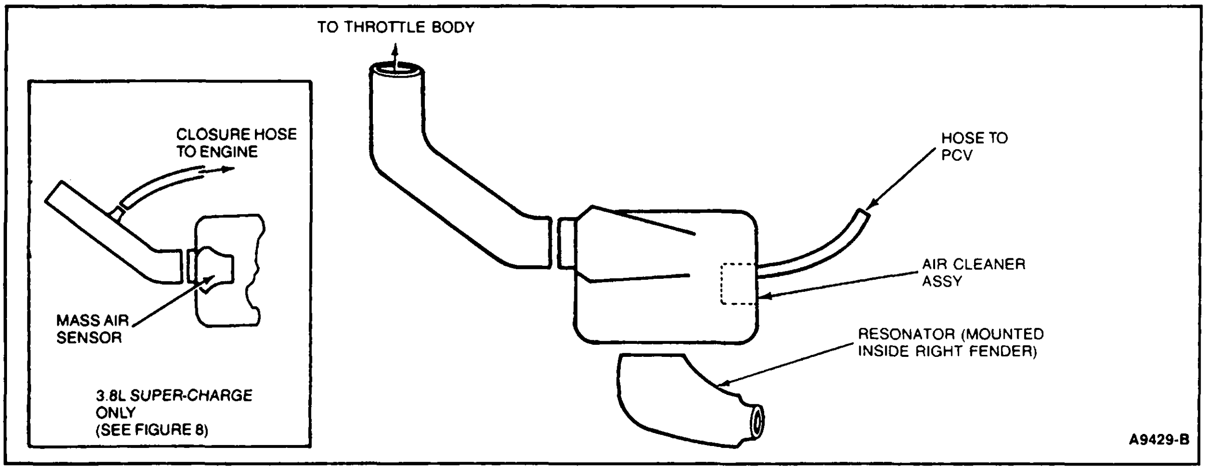

Figure 6 Typical Air Cleaner System — 3.8L SEFI (Thunderbird/Cougar)

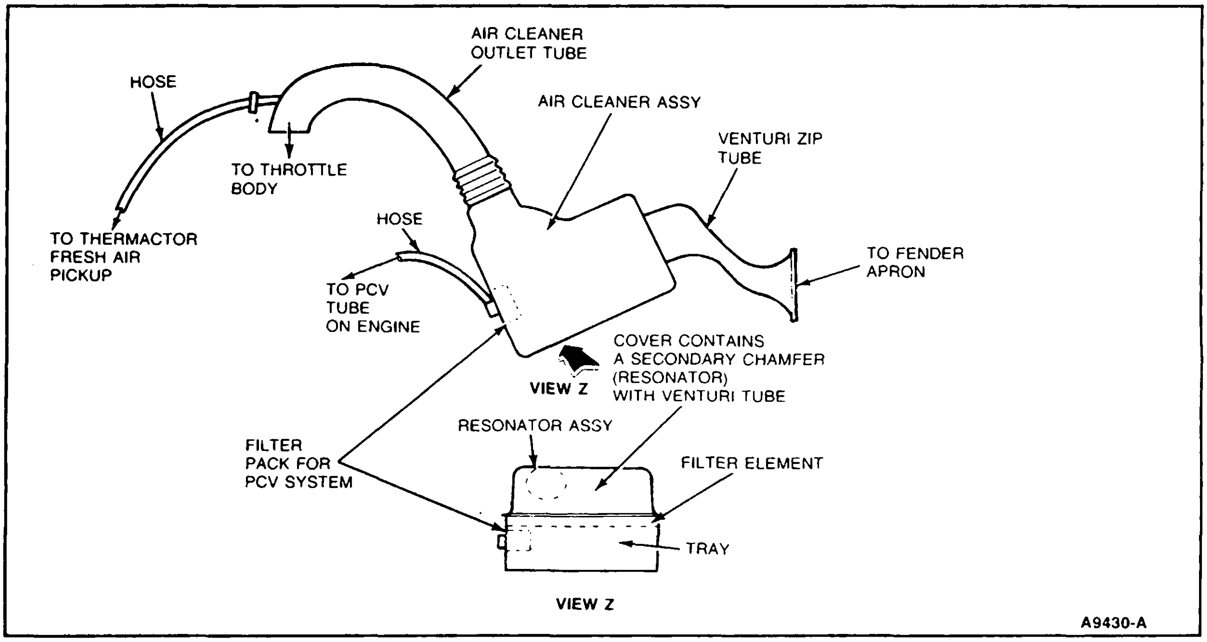

Figure 7 Typical Air Cleaner System — 3.8L SEFI (Taurus/Sable, Continental)

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Inlet Air Temperature Systems

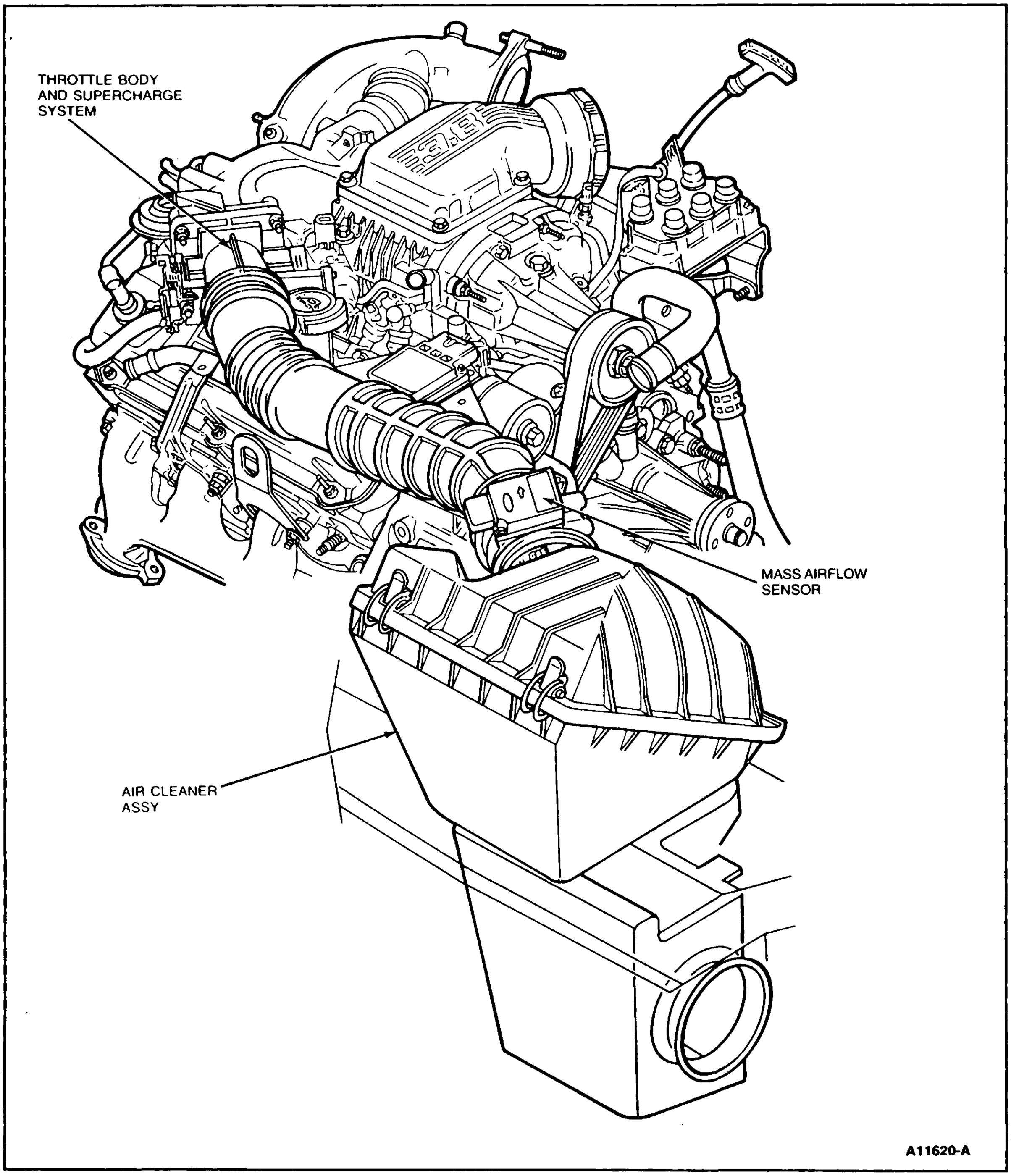

Figure 8 Typical Air Cleaner System — 3.8L SEFI Supercharged (Thunderbird/Cougar)

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Inlet Air Temperature Systems

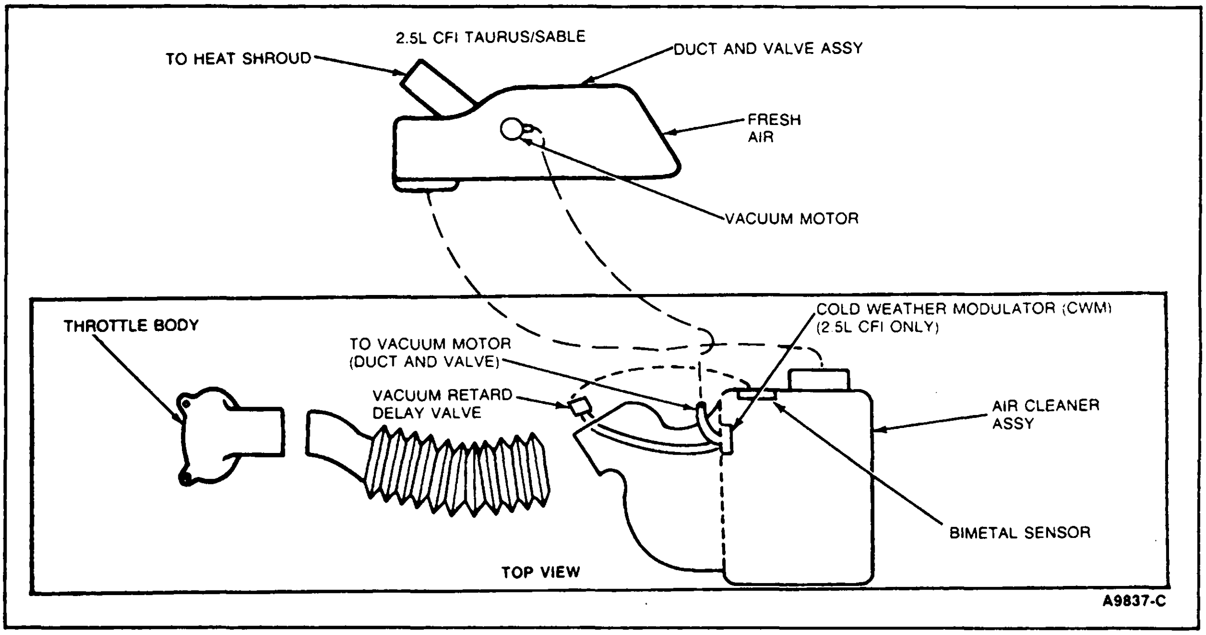

Figure 9 Typical Air Cleaner System — 2.5L CFI (HSC) (Passenger Car)

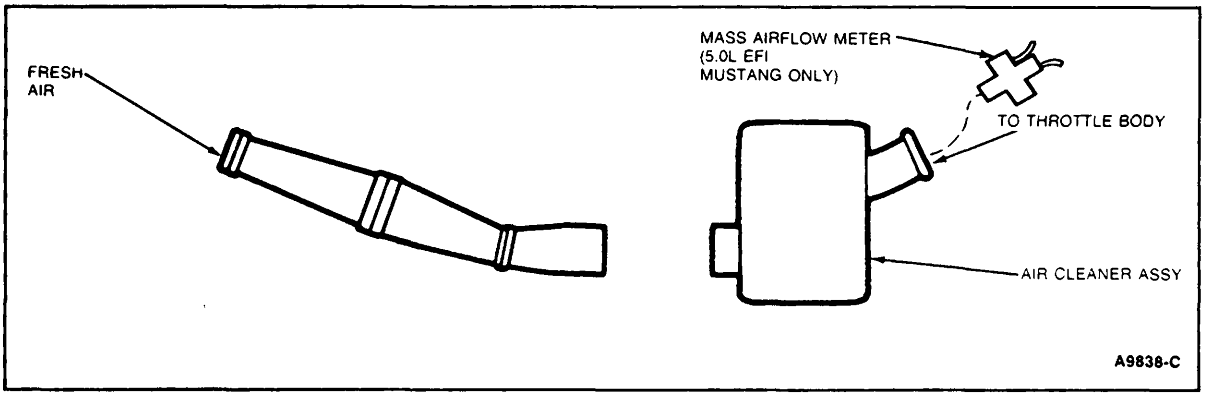

Figure 10 Typical Air Cleaner System — 5.0L SEFI (Mark VII, Mustang, Crown Victoria, Grand Marquis, Lincoln Town Car)

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Inlet Air Temperature Systems

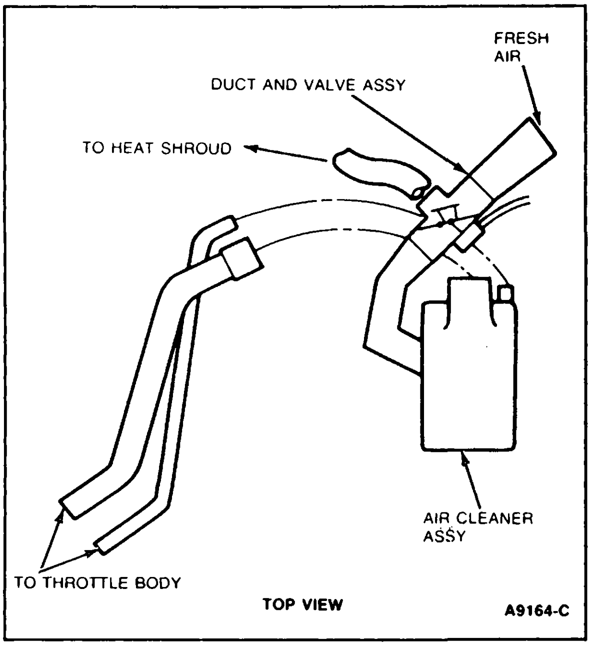

Figure 11 Typical Air Cleaner and Duct System — 2.9L EFI (Light Truck)

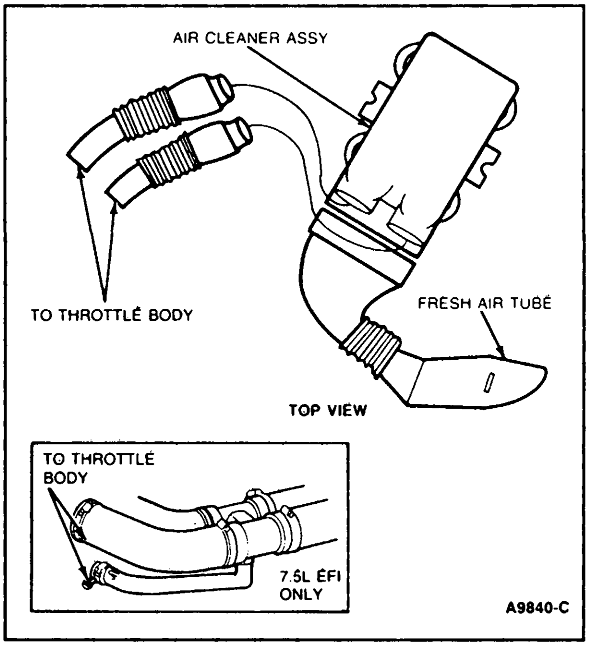

Figure 13 Typical Air Cleaner System — 4.9L through 7.5L E4OD EFI (F-Series or Bronco)

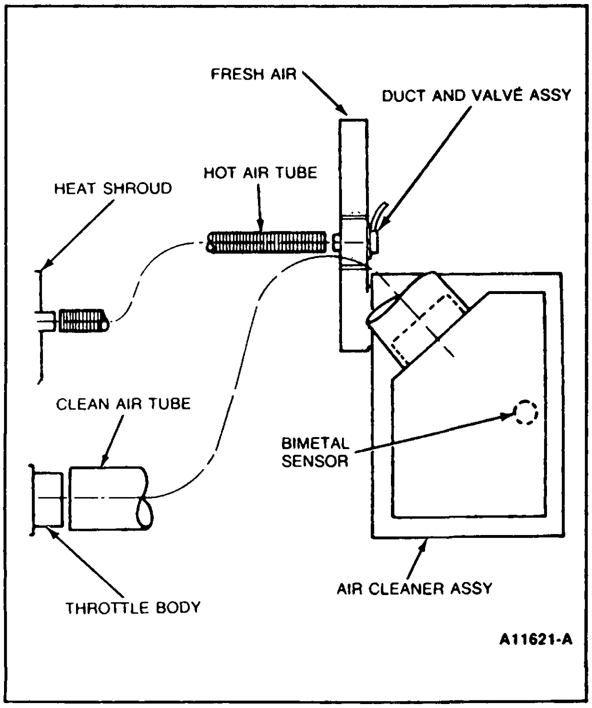

Figure 12 Typical Air Cleaner System — 2.3L EFI Dual Plug (Initial Production Units Only — Light Truck)

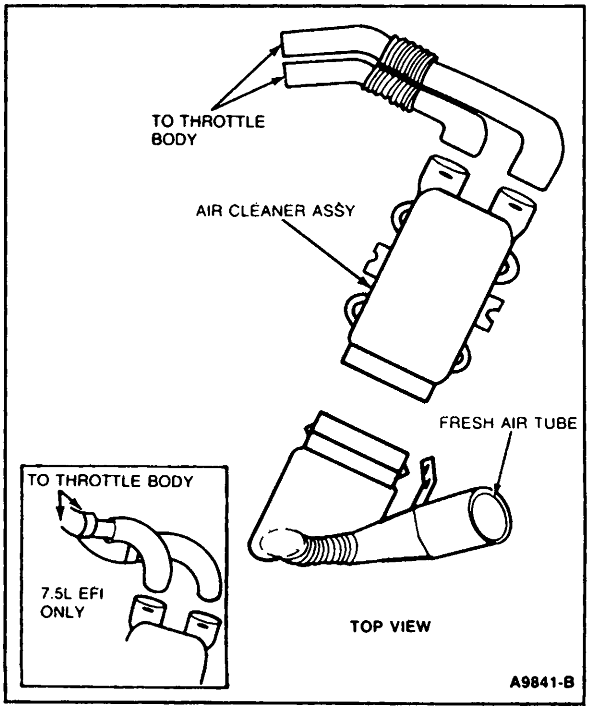

Figure 14 Typical Air Cleaner System — 4.9L through 7.5L E4OD EFI (E-Series)

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Inlet Air Temperature Systems

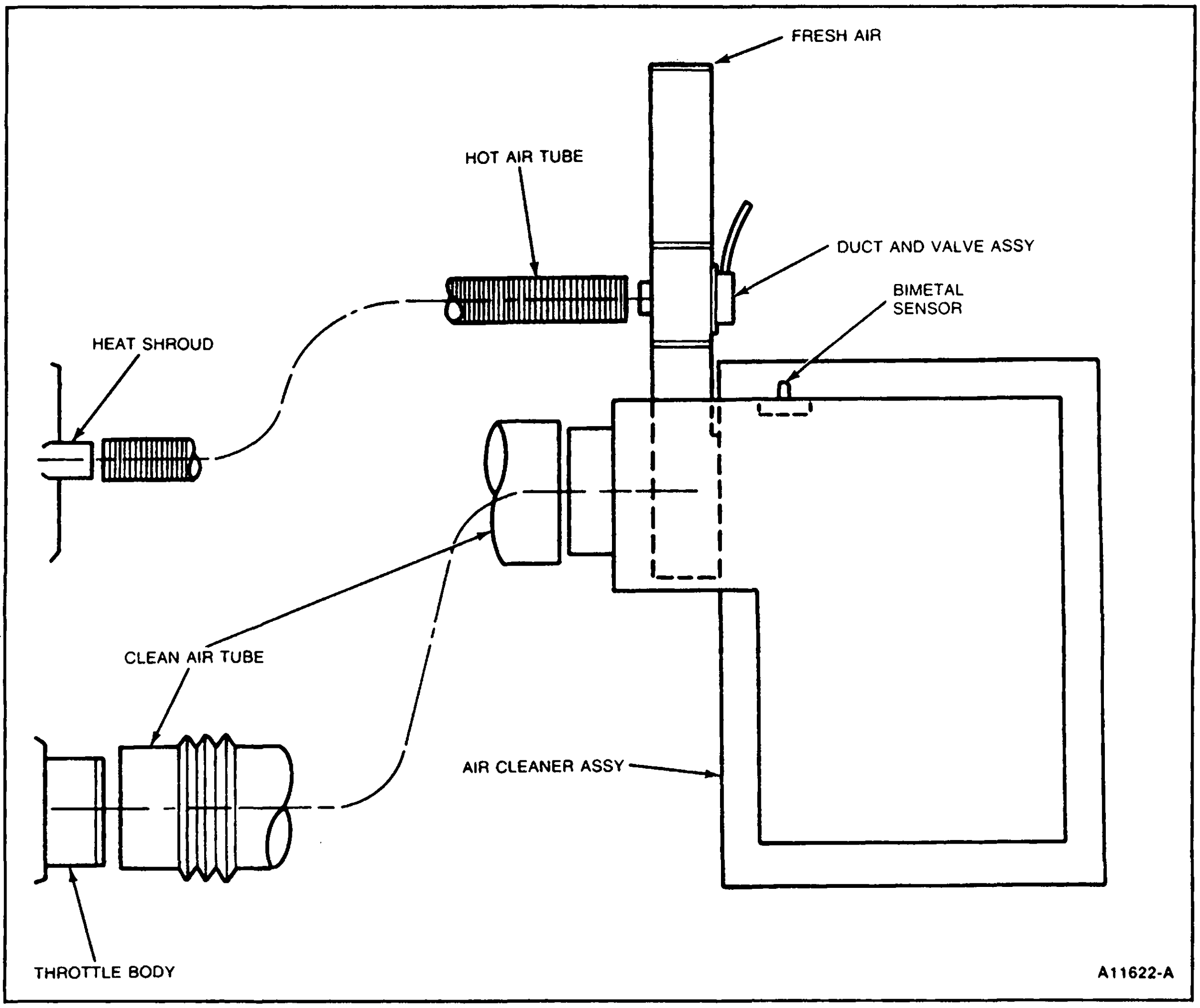

Figure 15 Typical Air Cleaner System — 2.3L EFI Dual Plug (Light Truck)

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SECTION 9

Positive Crankcase Ventilation Systems

Contents

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Positive Crankcase Ventilation System

DESCRIPTION

Typical Positive Crankcase Ventilation (PCV) System

The positive crankcase ventilation system (Figure 1) cycles crankcase gases back through the engine where they are burned. In a typical system, the PCV valve regulates the amount of ventilating air and blow-by gas to the intake manifold and prevents backfire from traveling into the crankcase. The PCV valve should be mounted in a vertical position (Figure 1). On some engine applications, the PCV system is connected with the evaporative emission system.

Unique 1.9L CFI Positive Crankcase Ventilation (PCV) System

The vent system for the 1.9L engine (Figure 2) does not depend on a flow of scavenging air, as do all other Ford engines, but evacuates crankcase vapors that are drawn into the intake manifold in metered amounts through a Dual Orifice Valve Assembly. A small orifice is connected to the intake manifold at all times. A larger orifice, controlled by a throttle body port signal, opens to the intake manifold during part throttle and WOT operation. If the availability of crankcase vapor is low (at idle for instance) air may be drawn along with crankcase vapor through the smaller orifice. If the availability of crankcase vapor is high (at high-speed operation) crankcase vapor is delivered to the intake manifold through both orifices. If the amount of crankcase vapor available exceeds that which can be handled by the two orifices, the excess flow is routed to the air cleaner. The Dual Orifice Valve is the critical point of this system.

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Positive Crankcase Ventilation System | Diagnostic Test | PCV

DIAGNOSTICS — TYPICAL PCV SYSTEM (EXCEPT 1.9L CFI)

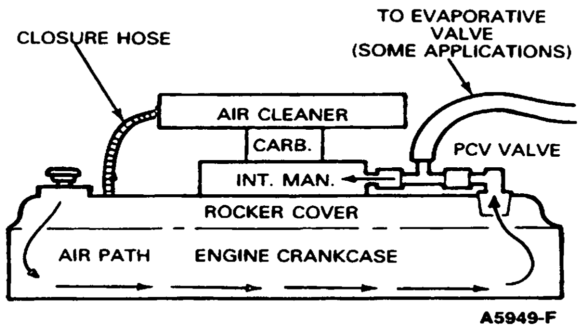

Figure 1 Typical PCV System (Except 1.9L with CFI)

Set parking brake and block wheels. Place transmission/transaxle in NEUTRAL or PARK. Place the A/C-Heat selector in the OFF position. Go to PCV Test Step 1.

TEST STEP	RESULT ▶	ACTION TO TAKE
PCV1 STUCK PCV VALVE CHECK		
• Remove PCV valve from rocker cover grommet. • Shake the PCV valve. • **Does the PCV valve rattle when shaken?**	Yes ▶	GO to **PCV2**.
	No ▶	PCV valve is sticking. REPLACE PCV valve.
PCV2 PCV SYSTEM CHECK		
• Start engine and bring to normal operating temperature. • Disconnect hose from air cleaner. • Place a stiff piece of paper over the hose, wait one minute. • Does the vacuum hold the paper in place? • For 2.3L HSC, 2.9L and 4.9L engines, remove the corrugated hose from the oil separator nipple and place a stiff piece of paper over the nipple. Wait one minute. • **Does the vacuum hold the paper in place?**	Yes ▶	System is OK. GO to Section 2 for vehicle symptoms.
	No ▶	System is plugged or Evaporative Emission Valve is leaking. GO to **PCV3**.
PCV3 EVAPORATIVE EMISSION SYSTEM CHECK		
• Disconnect evaporative hose, cap the tee, and retest. • Place a stiff piece of paper over the hose, wait one minute. • **Does the vacuum hold the paper in place?**	Yes ▶	GO to Evaporative Emission System, Section 7.
	No ▶	CHECK for vacuum in the system (filter cap, PCV valve, hoses, oil separator on 2.3L) and rocker cover for bolt torque/gasket leak. SERVICE as necessary.

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Positive Crankcase Ventilation System	Diagnostic Test	PCV

DIAGNOSTICS — UNIQUE 1.9L CFI PCV SYSTEM

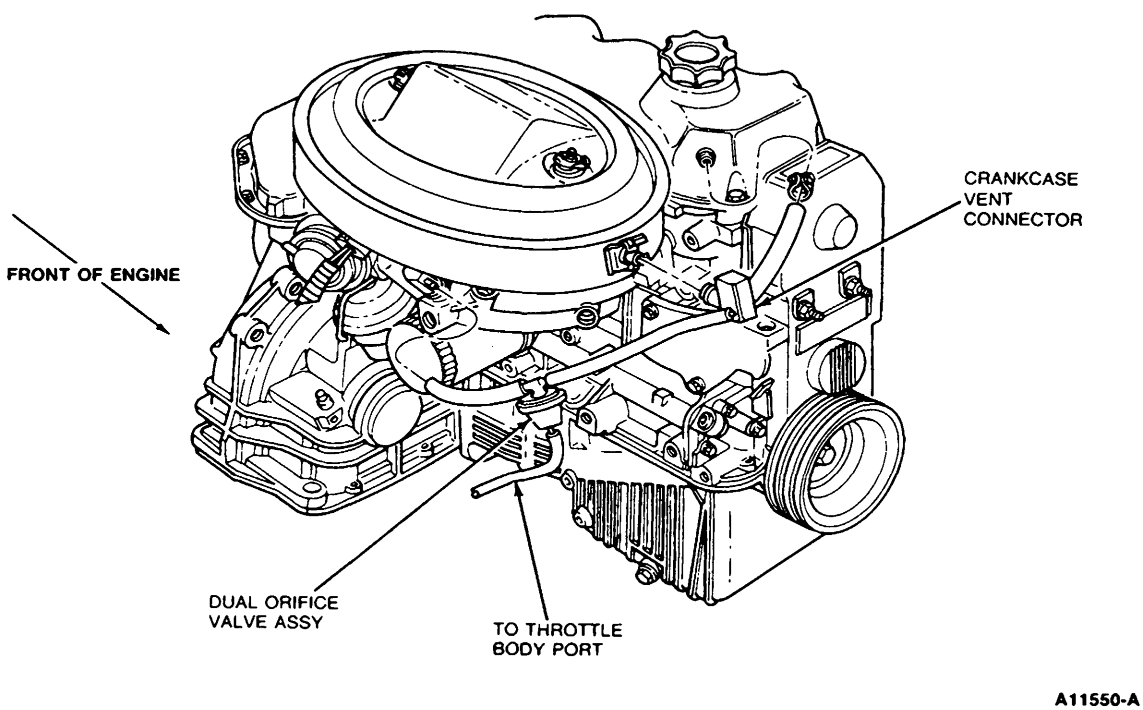

Figure 2 1.9L — CFI Engine PCV System

Set parking brake and block wheels. Place transmission/transaxle in NEUTRAL or PARK. Place the A/C-Heat selector in the OFF position. Bring engine to normal operating temperature and GO to PCV Test Step 1.

TEST STEP	RESULT ▶	ACTION TO TAKE
PCV1 1.9L CFI HIGH-SPEED PCV CHECK		
• Remove vacuum control hose at the dual orifice valve assembly (located at the throttle body port). • Apply manifold vacuum to port. • **Is there significant change in engine rpm?**	Yes ▶	High-speed PCV system is OK. GO to PCV2 .
	No ▶	REPLACE the dual orifice valve assembly.

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Positive Crankcase Ventilation System | Diagnostic Test | PCV

TEST STEP	RESULT ▶	ACTION TO TAKE
PCV2 1.9L CFI LOW-SPEED CHECK		
• Remove crankcase vent connector from side of air cleaner. • Place a stiff piece of paper over the crankcase vent connector nipple. Wait for one minute. • **Does vacuum hold the paper in place?**	Yes ▶	Low-speed PCV system is OK. GO to Section 2 for vehicle symptoms.
	No ▶	GO to PCV3 .
PCV3 CRANKCASE VENT CONNECTOR CHECK		
• Remove vacuum hose (small port) at the crankcase vent connector. • Place a stiff piece of paper over the vacuum hose. • **Does the vacuum hold the paper in place?**	Yes ▶	REPLACE crankcase vent connector.
	No ▶	GO to PCV4 .
PCV4 DUAL ORIFICE VALVE ASSEMBLY CHECK		
• Remove dual orifice valve assembly from the system. • Check for blockage through the valve. • **Is the valve clear of blockage?**	Yes ▶	REFER to Section 2 for vehicle symptoms.
	No ▶	REPLACE dual orifice valve assembly.

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SECTION 10

Thermactor Systems (Secondary Air Injection)

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Thermactor Systems (Secondary Air Injection)

Thermactor Air Injection System

Description

The Thermactor (air injection) Exhaust Emission Control System reduces the hydrocarbon and carbon monoxide content of exhaust gases by continuing the combustion of unburned gases after they leave the combustion chamber by injecting fresh air into the hot exhaust stream leaving the exhaust ports. At this point, the fresh air mixes with hot exhaust gases to promote further oxidation of both the hydrocarbons and carbon monoxide, thereby reducing their concentration and converting some of them into harmless carbon dioxide and water.

During some modes of operation (Hwy Cruise/WOT), the thermactor air is dumped to atmosphere to prevent overheating in the exhaust system.

A typical Air Injection System consists of:

- Air Supply Pump and Centrifugal Filter
- Air Bypass Valve
- Check Valve
- Air Manifold
- Air Hoses
- Air Control Valve

Diagnosis

1. Inspect the belt drive system and the air distribution system to ensure that they are in place and operating. Refer to Noise Test and Belt Adjustment in this Section.
2. Check out individual components, refer to Section 3.

Thermactor Air Strategy		
Thermactor Air States	**TAB Solenoid**	**TAD Solenoid**
Upstream	On	On
Downstream	On	Off
Bypass	Off	Off
TAB - Thermactor Air Bypass TAD - Thermactor Air Diverter		

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Thermactor Systems (Secondary Air Injection)

Managed Air Thermactor System

The Managed Air Thermactor System is utilized in several electronic and non-electronic control systems to divert thermactor air either upstream to the exhaust manifold check valve or downstream to the rear section check valve and dual bed catalyst. The system will also dump thermactor air to atmosphere during some operating modes.

Air control valve (9F491) is used to direct the air either upstream or downstream. An air bypass valve is used (9B289) to dump air to atmosphere (Figure 1).

Examples of other Managed Air Thermactor Systems are shown in Figures 2, 3, 4, 5, 6, 7, 8 and 9.

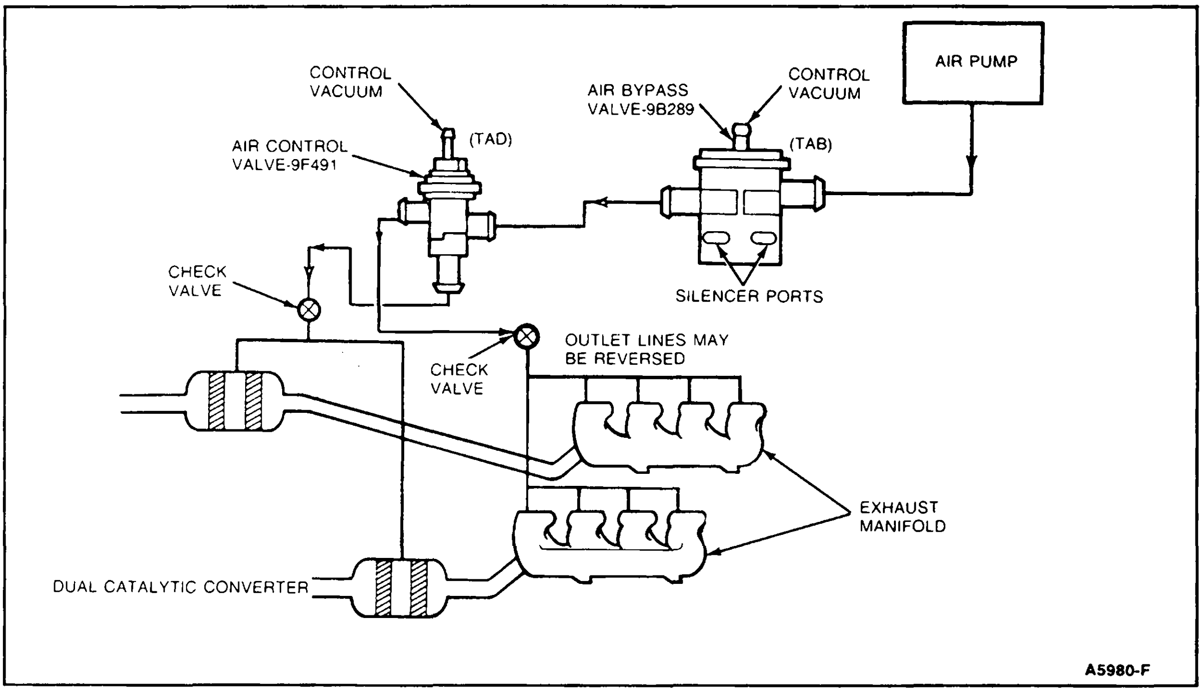

Figure 1 Typical Managed Air Thermactor System

NOTE: On 7.5L EFI Truck, disconnected vacuum hoses may result in a state emission test failure with no EEC self-test codes.

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Thermactor Systems (Secondary Air Injection)

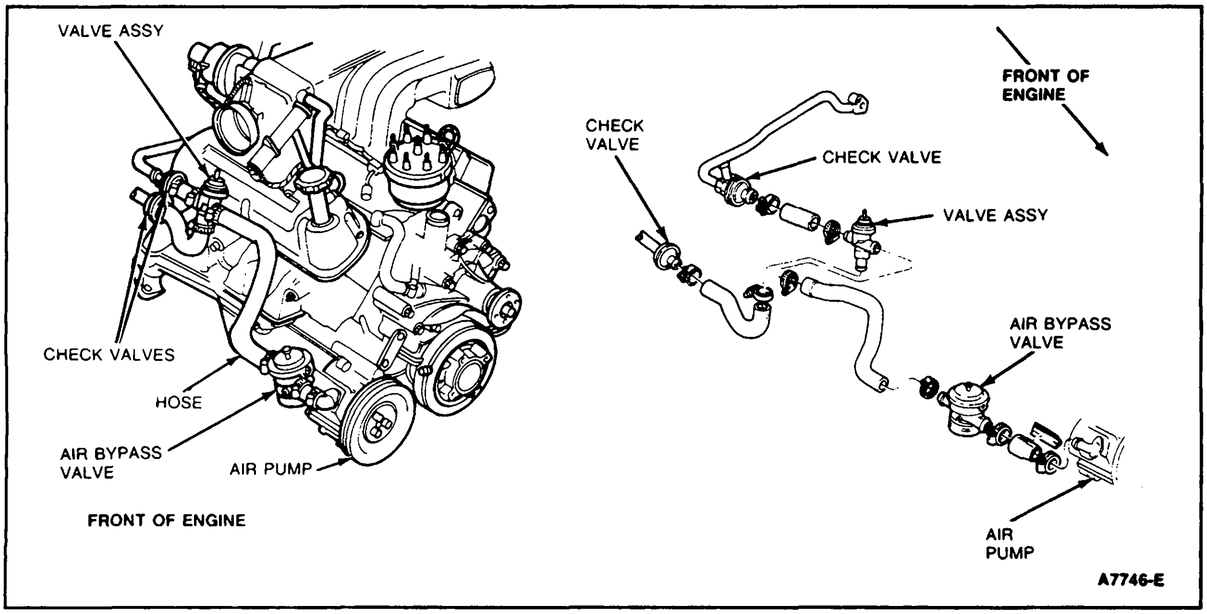

Figure 2 Locations of Thermactor Valves — 5.0L Engine (Passenger Car)

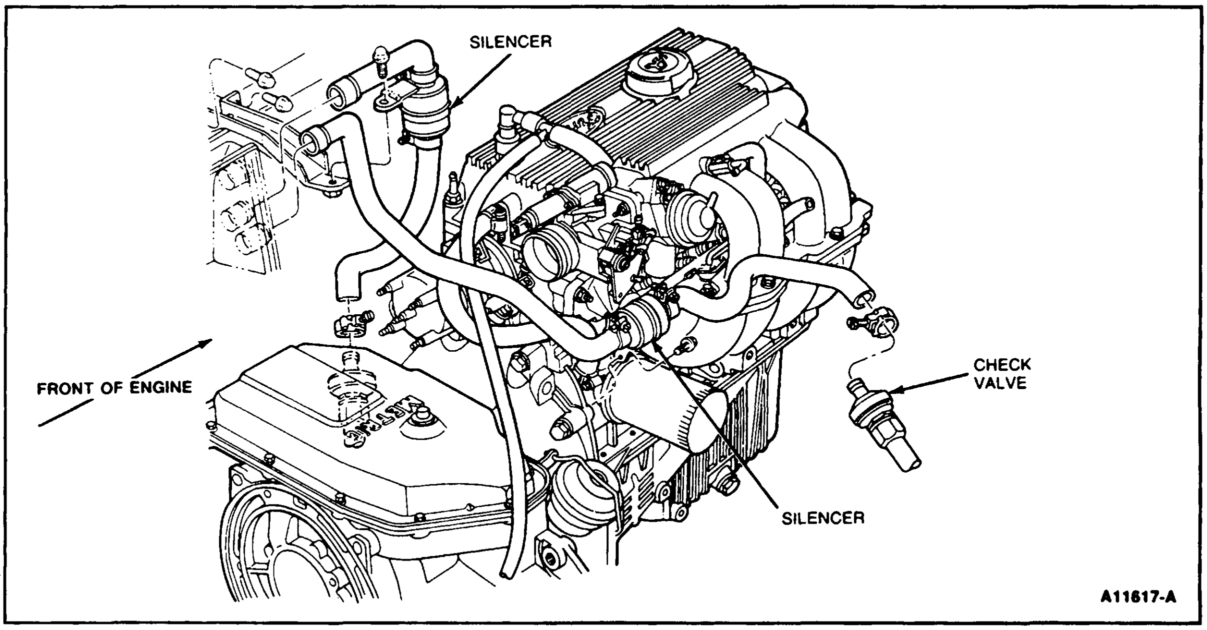

Figure 3 1.9L EFI HO Escort/Lynx (50 States)

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Thermactor Systems (Secondary Air Injection)

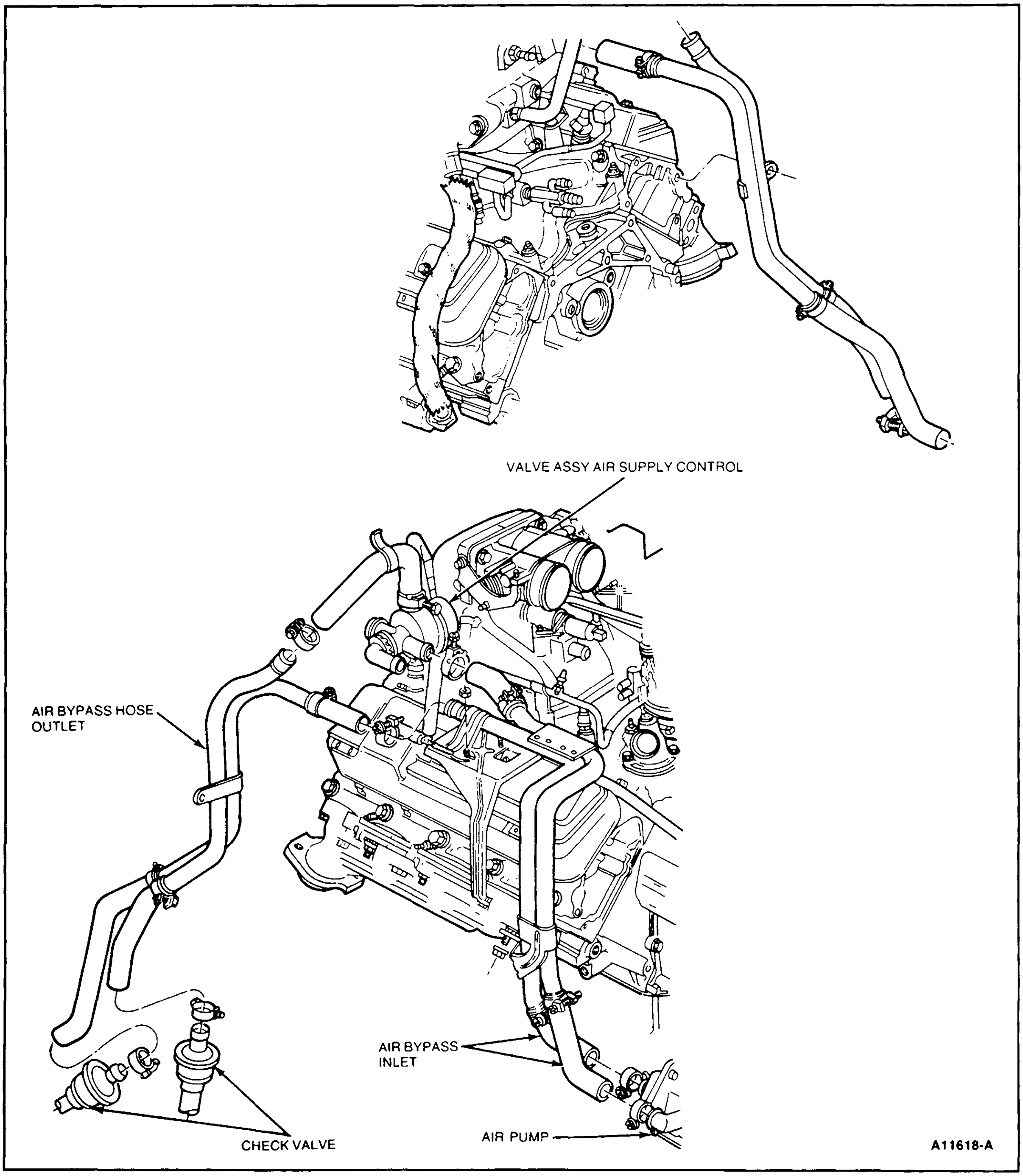

Figure 4 Dual Outlet Air Pump System — 7.5L EFI All GVW Auto/Manual

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Thermactor Systems (Secondary Air Injection)

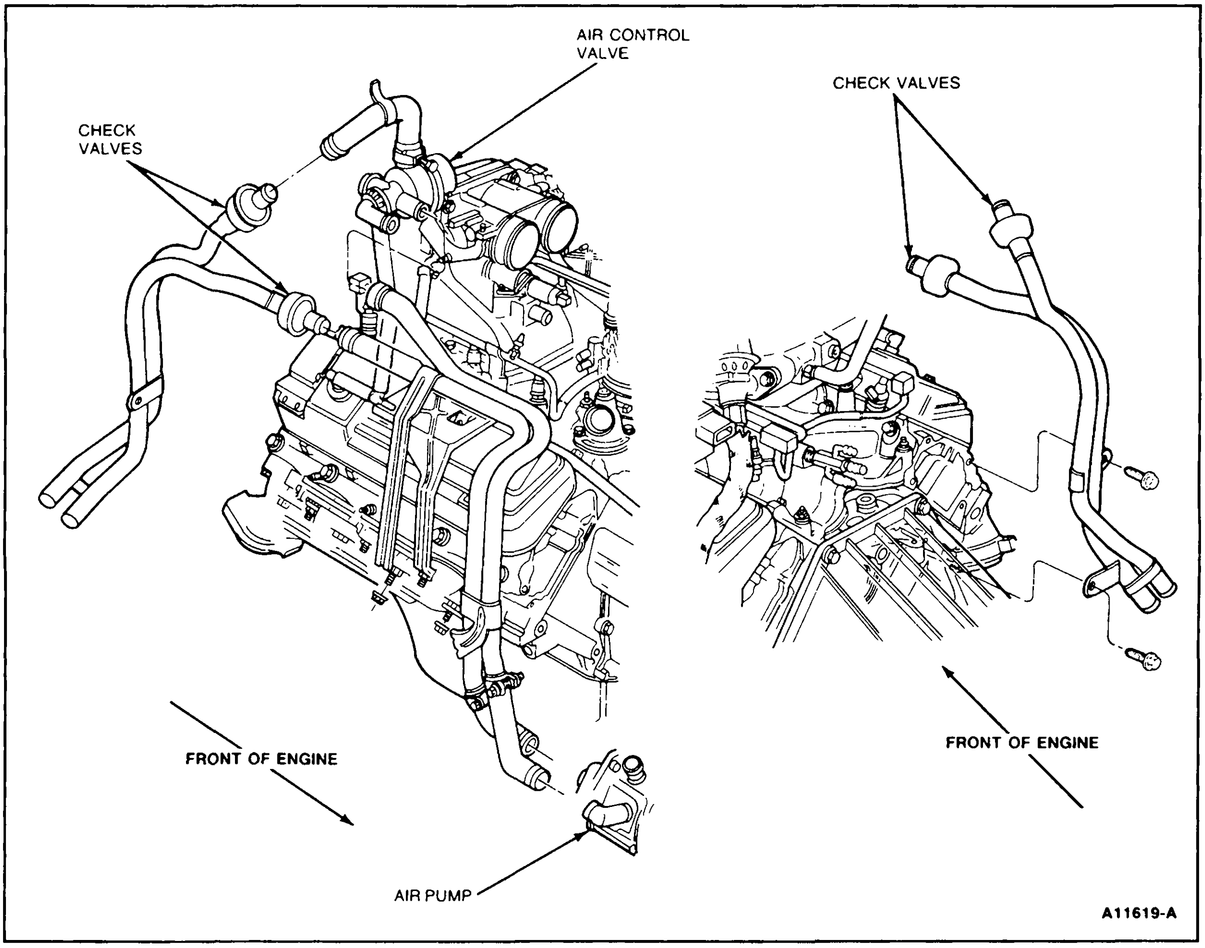

Figure 5 7.5L EFI 1989 Thermactor System — E4OD Only

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Thermactor Systems (Secondary Air Injection)

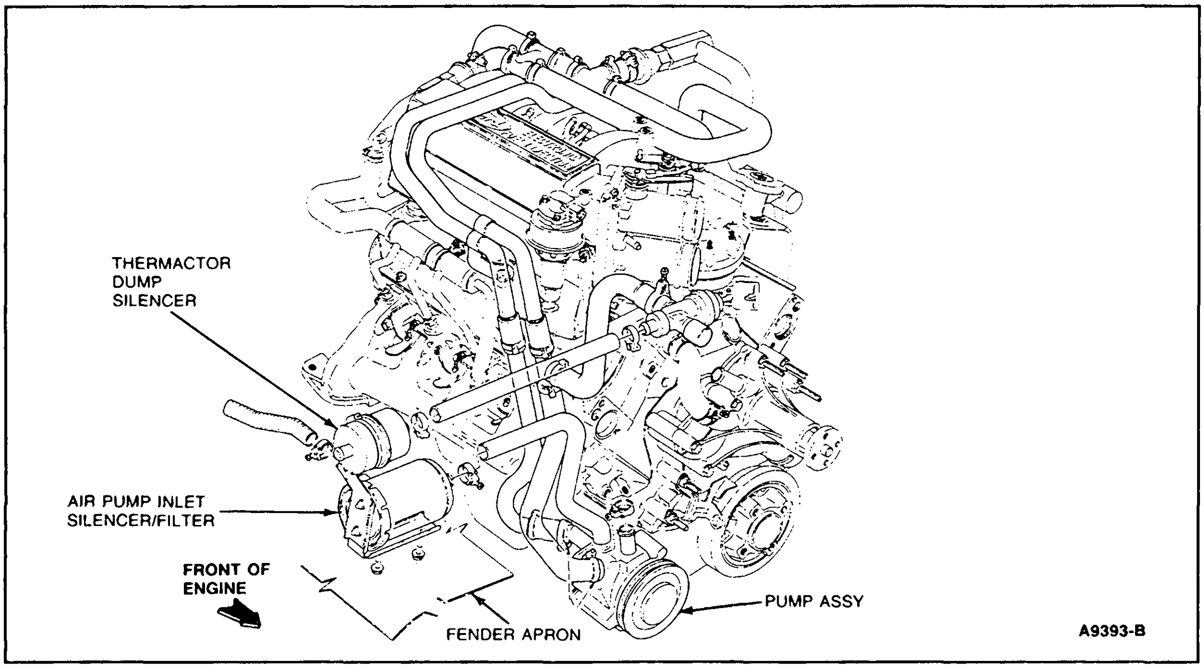

Figure 6 5.8L EFI 0/8500 GVW F-Series

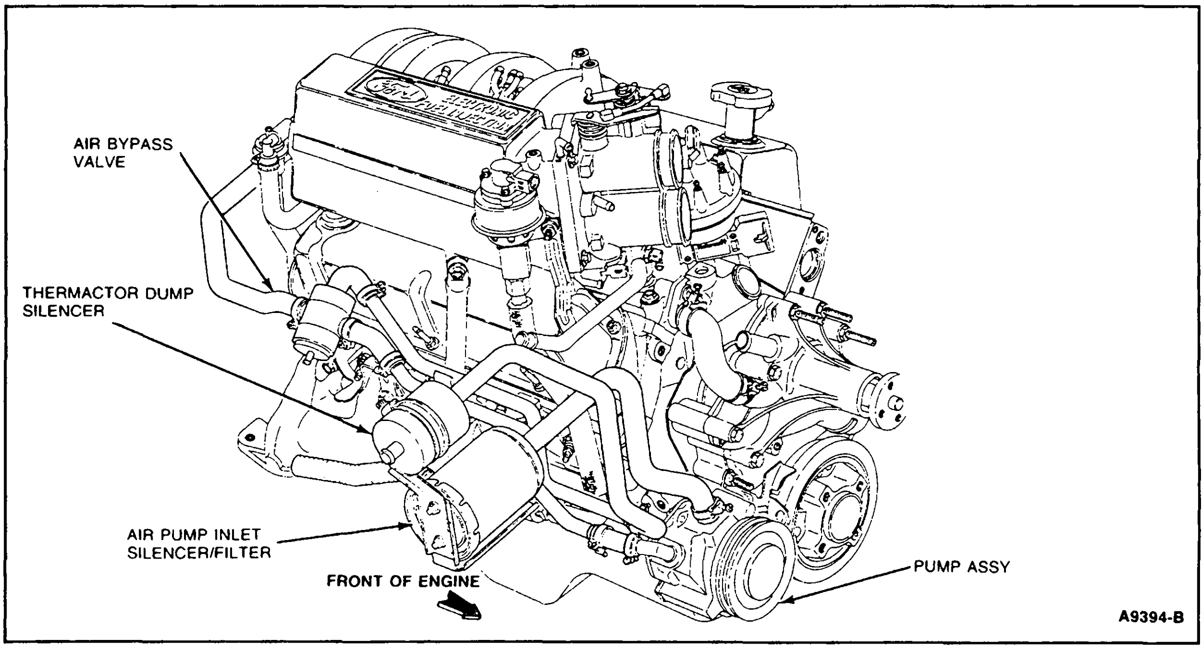

Figure 7 5.8L EFI U/8500 GVW F-Series/Bronco

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Thermactor Systems (Secondary Air Injection)

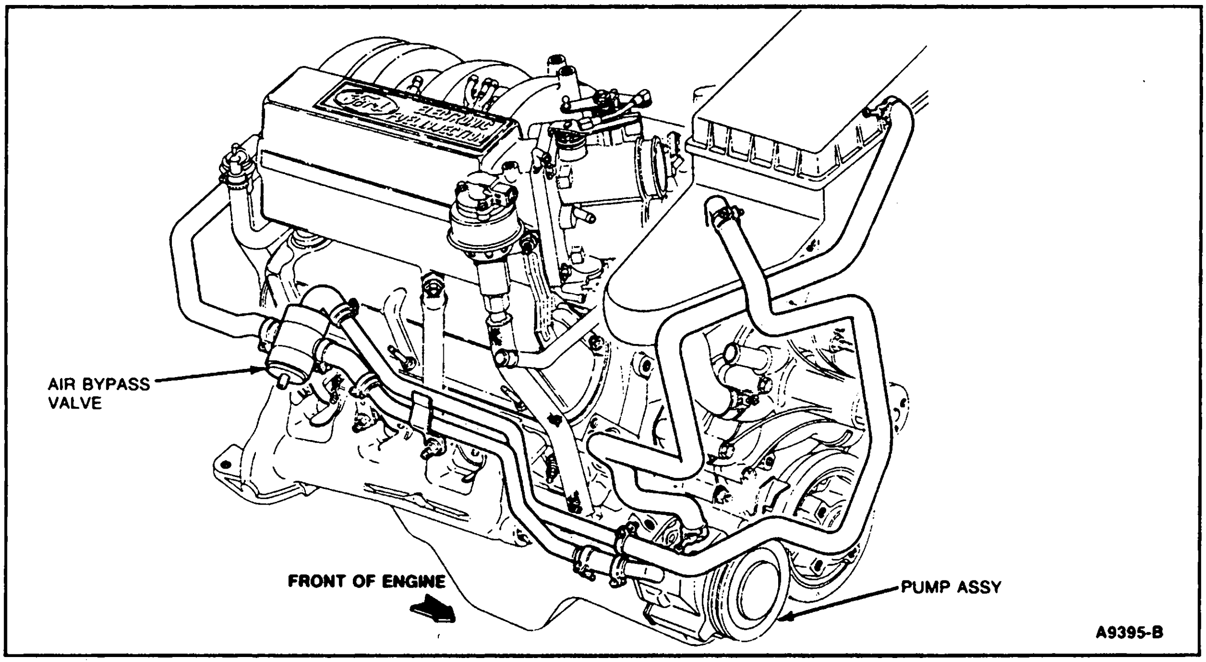

Figure 8 5.8L EFI U/8500 GVW E-Series

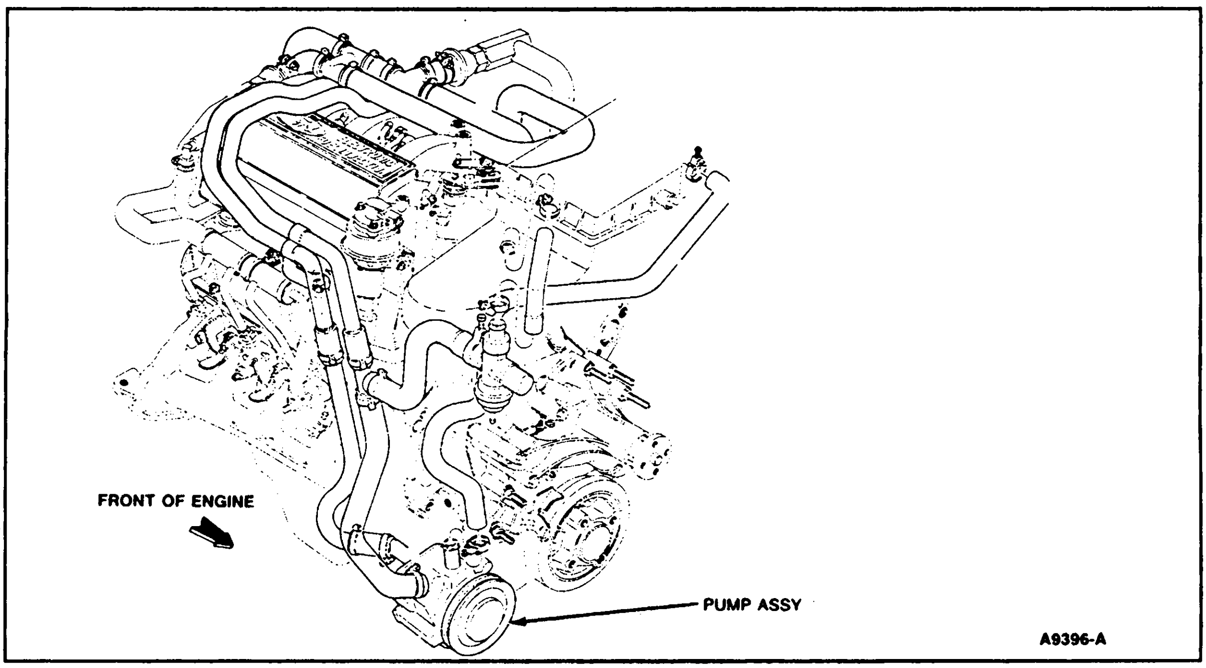

Figure 9 5.8L EFI 0/8500 GVW E-Series

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Thermactor Systems (Secondary Air Injection)

Pulse Air System (Thermactor II)

Description

Some engines are equipped with an air injection system called pulse air or Thermactor II, (Figure 10). The system does not use an air pump. The system uses natural pulses present in the exhaust system to pull air into the exhaust manifold and/or catalyst through pulse air valves. The pulse air valve is connected to the exhaust manifold and/or catalyst with a long tube and to the air cleaner or silencer with a hose.

Diagnosis

1. Check that air can flow freely through the air cleaner or silencer to the check valve.
2. Refer to check valve diagnosis in Section 3.

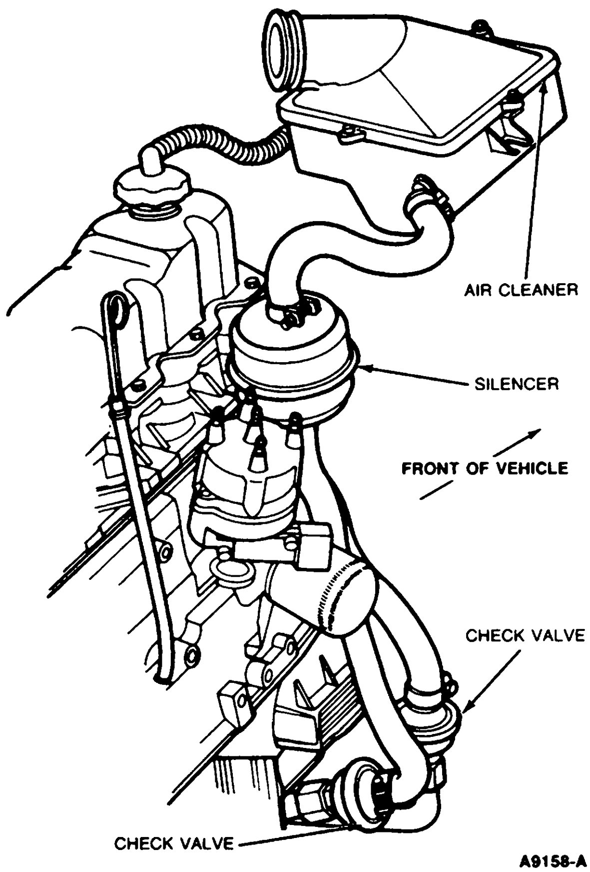

Figure 10 Pulse Air System (Thermactor II) — Typical

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Thermactor Systems (Secondary Air Injection)

Heavy Duty Truck Vacuum System

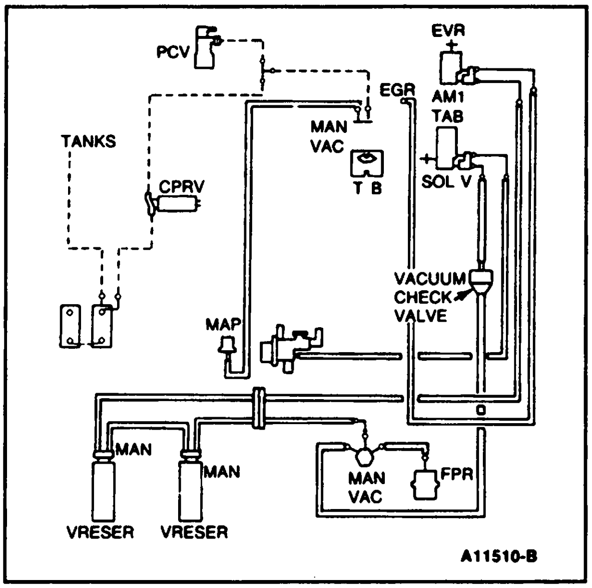

Figure 11 7.5L EFI Truck, Vacuum System

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Thermactor Systems (Secondary Air Injection)

Thermactor System Noise Test

CAUTION

Do not use a pry bar to move the air pump for belt adjustment.

NOTE: The thermactor system is not completely noiseless. Under normal conditions, noise rises in pitch as engine speed increases. To determine if noise is the fault of the air injection system, disconnect the belt drive (only after verifying that belt tension is correct), and operate the engine. If the noise disappears, proceed with the following diagnosis.

Diagnosis

CONDITION	POSSIBLE SOURCE	ACTION
• Excessive Belt Noise	• Loose belt.	• Tighten to specification using Tool T75L-9480-A or equivalent to hold belt tension and Belt Tension Gauge T63L-8620-A or equivalent. **CAUTION: Do not use a pry bar to move air pump.**
	• Seized pump.	• Replace pump.
	• Loose pulley.	• Replace pulley and/or pump if damaged. Tighten bolts to 13.6-17.0 N•m (120-150 lb-in).
	• Loose or broken mounting brackets or bolts.	• Replace parts as required and tighten bolts to specification.
• Excessive Mechanical Clicking	• Overtightened mounting bolt.	• Tighten to 34 N•m (25 lb-ft).
	• Overtightened drive belt.	• Same as loose belt.
	• Excessive flash on the air pump adjusting arm boss.	• Remove flash from the boss.
	• Distorted adjusting arm.	• Replace adjusting arm.

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Thermactor Systems (Secondary Air Injection)

SYMPTOM	POSSIBLE CAUSE	ACTION
• Excessive Thermactor System Noise (Putt-Putt, Whirling or Hissing)	• Leak in hose.	• Locate source of leak using soap solution, and replace hoses as necessary.
	• Loose, pinched or kinked hose.	• Reassemble, straighten, or replace hose and clamps as required.
	• Hose touching other engine parts.	• Adjust hose to prevent contact with other engine parts.
	• Bypass valve inoperative.	• Test the valve.
	• Check valve inoperative.	• Test the valve.
	• Pump or pulley mounting fasteners loose.	• Tighten fasteners to specification.
	• Restricted or bent pump outlet fitting.	• Inspect fitting, and remove any flash blocking the air passage way. Replace bent fittings.
	• Air dumping through bypass valve (at idle only).	• On many vehicles, the thermactor system has been designed to dump air at idle to prevent overheating the catalyst. This condition is normal. Determine that the noise persists at higher speeds before proceeding.
	• Air dump through bypass valve (decel and idle dump).	• On many vehicles, the thermactor air is dumped in the air cleaner or in remote silencer. Make sure hoses are connected and and not cracked.
• Excessive Pump Noise (Chirps, Squeaks and Ticks)	• Worn or damaged pump.	• Check the thermactor system for wear or damage and make necessary corrections.

Thermactor Air Pump Drive Belt Adjustment

1. Check all air pump pulleys and mounting bolts, and tighten to specification, if required.
2. Install the belt tension gauge (Tool T63L-8620-A or equivalent) on the drive belt, and check the tension. Compare the belt tension to the specified belt tension and adjust as necessary.
3. If adjustment is necessary, loosen the air pump mounting and adjusting arm bolts, move the air pump toward or away from the engine until the correct tension is obtained. Use air pump belt tensioning tool (Tool T75L-9480-A or equivalent) to hold belt tension while tightening the mounting bolts. Install the tension gauge and check the belt tension.

CAUTION

Do not use a pry bar.

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SECTION 11

Fuel Delivery Systems

Contents

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Fuel Delivery Systems

FUEL DELIVERY SYSTEM DIAGNOSTICS

CAUTION: USE CARE TO PREVENT COMBUSTION FROM FUEL SPILLAGE
NO SMOKING, OPEN FLAMES OR ANY KIND OF ARCING

DRIVEABILITY SYMPTOM MENU
CRANKS NORMALLY BUT WON'T START
STARTS NORMALLY BUT WON'T RUN (STALLS)
CRANKS NORMALLY BUT SLOW TO START
MISSES UNDER LOAD
HESITATES OR STALLS ON ACCELERATION
BACKFIRE (INDUCTION OR EXHAUST)
LACK OF POWER
SURGES AT STEADY SPEED
POOR FUEL ECONOMY
GAS SMELL

Pre-checks

- Verify battery is fully charged.
- Check for adequate fuel supply in fuel tank.
- Verify fuse/fuse link integrity.
- Inertia switch is set.
- Verify engine at operating temperature, transmission in NEUTRAL or PARK and brakes applied.
- Inspect all hoses, fuel lines and fuel tanks for deformities, kinks and leaks.
- Check fuel pump and fuel line connections for fuel leaks.
- Check fuel pressure regulator CFI/EFI area for fuel leaks.

NOTE: For additional information, refer to Group 24 in the Car or Truck Shop Manual.

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Fuel Delivery Systems

WARNING — INSTRUCTIONS

Fuel in the fuel system remains under high pressure even when the engine is not running. To avoid injury or fire, release the fuel pressure from the fuel system before disconnecting any fuel line. To release the pressure from the system perform the following:

— Connect the Rotunda Fuel Pressure Testing Kit, No. 014-00447 or equivalent at the Schrader valve located on the fuel rail, with the Testing Kit valve closed.

— Gradually open the Testing Kit valve to relieve fuel pressure in the vehicle fuel system and drain the fuel into a suitable container or return it to the fuel tank.

— To avoid unnecessary fuel spillage and fire hazard at any time fuel lines are disconnected, the ignition switch should be in the OFF position unless fuel pump operation is required for test purposes.

SPECIAL SERVICE TOOLS

TOOL NO.	DESCRIPTION	TEST STEP
014-00447	Fuel Pressure Testing Kit	EFD 2, 28, 29, 33, 34, 48
007-00001	Digital Volt-Ohm Meter	EFD 26, 45
021-00037	Vacuum Tester	EFD 30, 37, 49, 50, 51
059-00008	Vacuum and Pressure Tester	EFD 42, 43
113-00001	Fuel Injector Tester/Cleaner	EFD 46
—	Mechanics Stethoscope	EFD 44

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Mechanical Fuel Delivery Systems

MFD

TEST STEP	RESULT ▶	ACTION TO TAKE
MFD1 CHECK FUEL PRESSURE		
• Install fuel pressure gauge at the carburetor. • Reconnect fuel line. • Start and run engine at 1500 rpm for 30 seconds. • With engine at idle, read the fuel pressure gauge. **NOTE: If you are here for a no start, just crank the engine and read the fuel pressure gauge 6.0 psi at 10 second cranking.** • **Is fuel pressure within 6.0-8.0 psi?**	Yes ▶ No ▶	GO to MFD2 . GO to MFD3 .
MFD2 CHECK FUEL VOLUME		
• Disconnect primary side of ignition coil. • Disconnect fuel line at the carburetor. • Slide a flexible fuel resistant hose onto the disconnected fuel line and hold it into a clear plastic fuel resistant container. • Verify smallest diameter in fuel line is greater than 0.22 inch. • With a remote starter button, crank the engine. • **Is the volume 0.3 pint/10 seconds?** • Save fuel in container for MFD6 .	Yes ▶ No ▶	REPLACE fuel filter and, or SERVICE carburetor. RECONNECT ignition coil. Go to MFD6 .
MFD3 CHECK AUXILIARY FUEL SUPPLY		
• Use an auxiliary fuel supply and route the flexible fuel line under the fender or bumper to the inlet side of the fuel pump. • Repeat Test MFD1 and MFD2 . • **Is fuel pressure at least 6.0 psi and fuel volume 0.3 pint/10 seconds?**	Yes ▶ No ▶	RECONNECT the fuel line at the fuel pump. GO to MFD4 . REPLACE fuel pump and fuel hose.

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Mechanical Fuel Delivery Systems — MFD

TEST STEP	RESULT ▶	ACTION TO TAKE
MFD4 CHECK FUEL LINE		
• Disconnect the fuel line at the tank. • Connect auxiliary fuel supply to the fuel line. • Repeat Test MFD1 and MFD2. • **Is fuel pressure at least 6.0 psi and fuel volume 0.3 pint/10 seconds?**	Yes ▶	GO to MFD5.
	No ▶	BLOW OUT fuel line. SERVICE fuel line. REPLACE flexible hoses.
MFD5 CHECK FUEL TANK SENDER UNIT		
• Drain fuel tank, but not completely. • Disconnect fuel return line if applicable. • Disconnect fuel sender unit. • Disconnect evaporative system from fuel tank. • Lower the fuel tank and remove sender unit. • Inspect sender unit for being bent, blocked or rusted through. • **Is fuel sender unit defective?**	Yes ▶	REPLACE the fuel sender unit.
	No ▶	GO to MFD6.
MFD6 CHECK FUEL CONTAMINATION		
• Check remaining fuel in the tank for contamination. • Check the fuel sample from test MFD2 for contamination. • **Is the fuel contaminated?**	Yes ▶	DUMP/FLUSH the fuel tank. BLOW OUT the fuel lines. REPLACE fuel filters. CLEAN out carburetor.
	No ▶	Problem may be elsewhere. GO to Section 2.

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Electric Fuel Delivery System | EFD

VEHICLE APPLICATION

F, E Series: 4.9L, 5.0L, 5.8L, 7.5L EFI
Bronco: 4.9L, 5.0L, 5.8L EFI
Ranger, Bronco II: 2.3L, 2.9L EFI
Aerostar: 2.3L, 3.0L EFI
Passenger Car: All with EFI/CFI

DESCRIPTION

Types of Systems

Fuel delivery systems using Electronic Fuel Injection (EFI) differ in their design and arrangement, depending upon the vehicle and model year. To clarify understanding and to simplify diagnostic instruction they are classified by Types 1 through 4, as shown in the System Schematics, together with vehicle models and model years in production and are listed as follows:

Type 1	Single Tank, Single Pump
Type 2	Single Tank, Dual Pump
Type 3	Dual Tank with Electric Selector Valve
Type 4	Dual Tank with Mechanical Selector Valve/Reservoir

For supplying the fuel injectors continuously with clean fuel at a controlled high pressure, all such systems require a high-pressure fuel pump with discharge check valve, a reservoir near the pump inlet, a fine mesh fuel filter, a pressure regulator, a fuel supply and return system, a fuel tank, and a fuel supply manifold or fuel rail connected to the fuel injectors. The Electronic Control Assembly (ECA) controls power input to the fuel delivery system and provides correct timing for the fuel injectors.

Low-Pressure Fuel Pump

All fuel systems with EFI require a high-pressure pump, but some are two-pump systems having a primary, or low pressure in-tank pump for supplying fuel to the reservoir (Types 2, 3, & 4 Systems). The low-pressure pump rests in a sump, or depression, in the fuel tank. A nylon screen protects the low-pressure pump inlet from contaminating particles but allows the passage of small amounts of water which may accumulate in the fuel tank sump. When dual tanks are used, each tank is equipped with its own low-pressure pump, making a total of three pumps in the system, two low-pressure and one high-pressure.

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Electric Fuel Delivery System

EFD

High-Pressure Fuel Pump

Type 1 Systems use a single pump, wherein the low-pressure in-tank pump is not used, but is replaced by a high-pressure in-tank pump. It is capable of pumping in excess of 60 liters (16 gal.) of fuel per hour at a working pressure of 270 kPa (39.2 psi), and has an internal pressure relief valve, set to 850 kPa (123 psi) to protect against over-pressure due to fuel flow restriction. It also has a discharge check valve (to maintain system pressure during shutdowns and to minimize starting problems), and an inlet screen for protection.

Types 2, 3, and 4 Systems use two pumps with a low-pressure in-tank pump, a high-pressure in-line pump mounted inside the left frame rail, and a reservoir in-line between the two. Other high-pressure pumps used in these systems are 80 liter (21 gal) and 100 liter (26 gal) minimum per hour capacities, depending upon the vehicle application. These pumps also have internal relief valve and discharge check valve.

Reservoirs and Filters

Fuel reservoirs are used to prevent fuel flow interruptions during extreme vehicle maneuvers with low tank fill levels. In-line reservoirs (Types 2, 3, & 4) are frame mounted, and are always located between the low and high-pressure pumps. If the high-pressure pump is located in-tank (Type 1), the reservoir is either molded into the tank (plastic tank only) or into the fuel pump and sender plastic housing. In-line reservoirs are of two types, the standard single function design used with Types 2 and 3 Systems or the dual function design having the integral mechanical selector valve (Type 4 System). The standard single function reservoir, used on Type 2 and 3 systems, may contain a serviceable paper element filter, which was replaced in late 1986 and later models by a fine mesh in-line filter located between the high-pressure pump and the fuel rail. Simultaneously, a fine screen was added to the high-pressure pump inlet.

Selector Valves (Dual Tank Only)

Selector valves are used on F and E series and on Ranger vehicles equipped with dual fuel tanks (Types 3 and 4 Systems). A driver operated selector switch controls the selector valve for switching the fuel supply from one tank to the other. Two types of valves are used, electrical (Type 3) or mechanical (Type 4). The electric valve, when energized by the selector switch, moves its valve to shut off the supply and return lines from one tank and to open the lines to the other tank. Simultaneously the in-tank pump and fuel level sender are turned off for one tank and energized for the other. The mechanical selector valve is contained within the six-port reservoir assembly (the so-called "dual function reservoir"), is identified in these diagnostics as "Mechanical Selector Valve/Reservoir", and is used in the Type 4 system only. It switches fuel supply and return lines from one tank to the other in response to fuel pressure from in-tank pumps acting on its actuating diaphragm. The diaphragm switches tank connections under 2 psi of fuel pressure acting on its upper side for the front tank and on its lower side for the rear tank. Good valve functioning depends upon proper operation of the in-tank low-pressure pumps. In all dual tank vehicles, excess fuel not used by the engine is returned to the same tank from which it was pumped.

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Electric Fuel Delivery System

EFD

Pressure Regulator

A fuel pressure regulator, located downstream from the fuel injectors, and on the fuel rail, controls the fuel injection pressure. Nominal fuel pressure is established by a spring acting on one side of the diaphragm/valve, opposed by fuel pressure on the opposite side. Intake manifold pressure also acts on the same side as the spring to maintain a constant pressure drop through the injectors. Fuel in excess of engine demand is bypassed in the fuel pressure regulator and returns to the fuel tank through the fuel return lines.

Test Point

A pressure test point, equipped with a Schrader fitting, is provided in the engine fuel rail for the purpose of relieving pressure in the fuel system and for measuring the injector supply pressure for service and diagnostic work.

Fuel Pump Circuit Operation

When the ignition is switched to the ON position, it turns the EEC Power Relay on. The EEC Power Relay provides power to the Electronic Control Assembly (ECA) and the control side of the fuel pump relay. Power for the fuel pump(s) is supplied through a fuse link or high current fuse attached to the starter solenoid (battery side). From the fuse link or high current fuse current flow is through the fuel pump relay and inertia switch to the fuel pumps(s). The inertia switch is a safety device used to shut off the fuel pump(s) in the event of a collision. If the inertia switch is "tripped" it must be reset by depressing the white or red button on the top of the switch. The fuel pump relay is controlled by the ECA.

When the ignition switch is turned to the ON position, the fuel pump(s) will operate. If the ignition switch is not turned to the START position the ECA will shut the fuel pumps off after approximately one second. The ECA will operate the fuel pump(s) when the ignition is in the START position to provide fuel while cranking.

After the engine starts, the ECA will continue to operate the fuel pump(s) unless the engine stops or engine speed drops below 120 rpm, or the inertia switch is "tripped".

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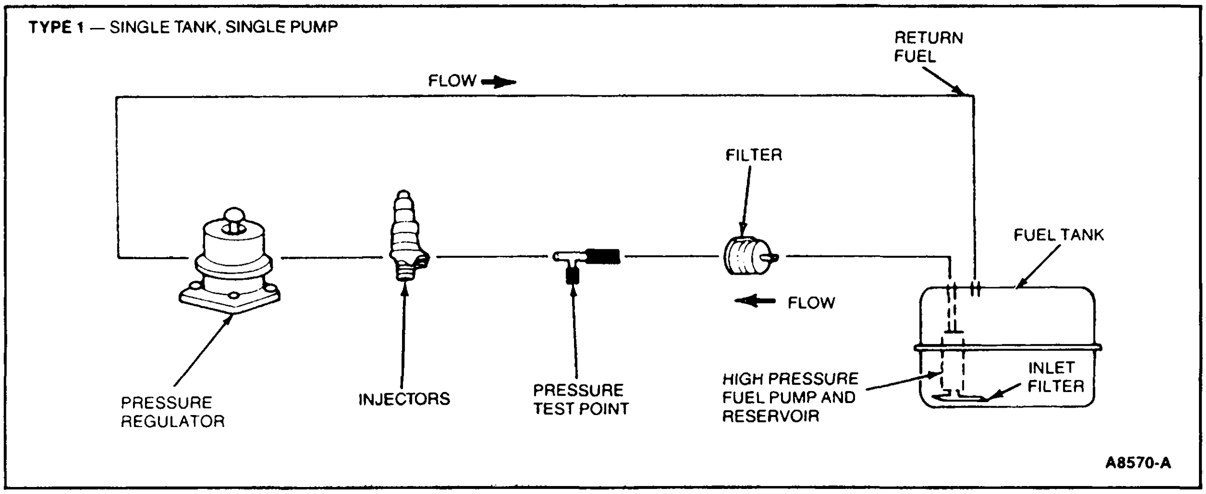
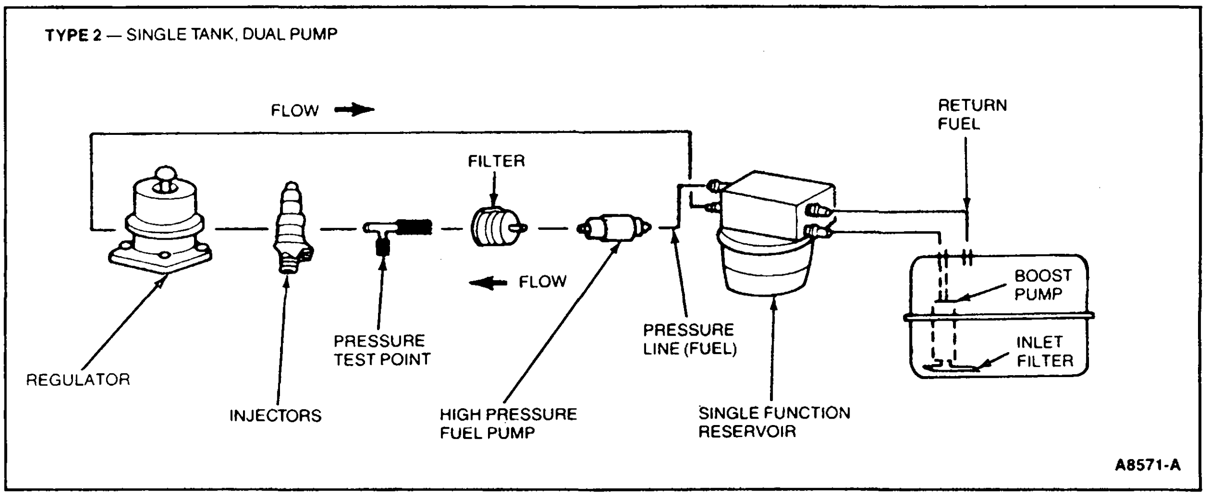
Electric Fuel Delivery System

EFD



VEHICLE APPLICATION
Passenger Car EFI/CFI
Aerostar 1986 1/2 and later model years, EFI
Ranger, Bronco II, 1989 model year, EFI



VEHICLE APPLICATION
E and F Series, Bronco, 1985 and later model years, EFI
Ranger/Bronco II, 1985-89 model years, EFI
Aerostar, early 1986 model year, EFI

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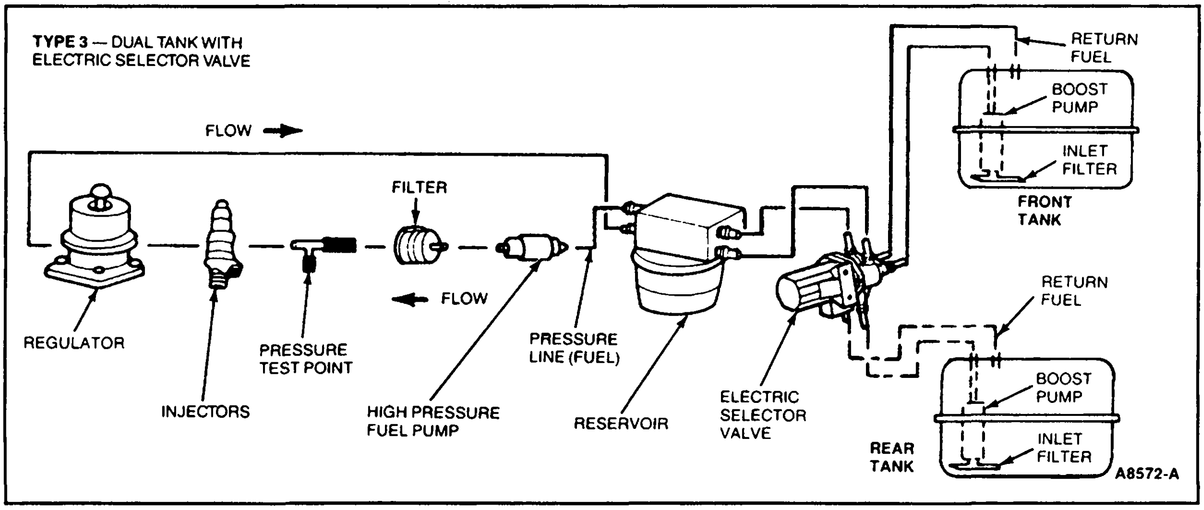
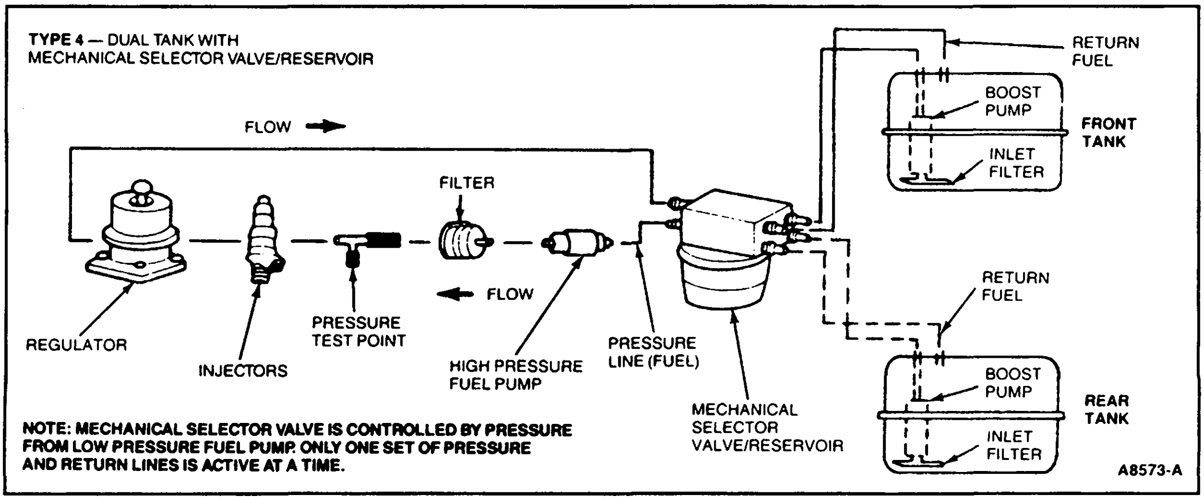
Electric Fuel Delivery System

EFD



VEHICLE APPLICATION

F Series 1985 model year, EFI
E Series 1985-87 model years, EFI
Ranger 1985-88 model years, EFI



VEHICLE APPLICATION

E Series 1988 and later model years, EFI
F Series 1986 and later model years, EFI

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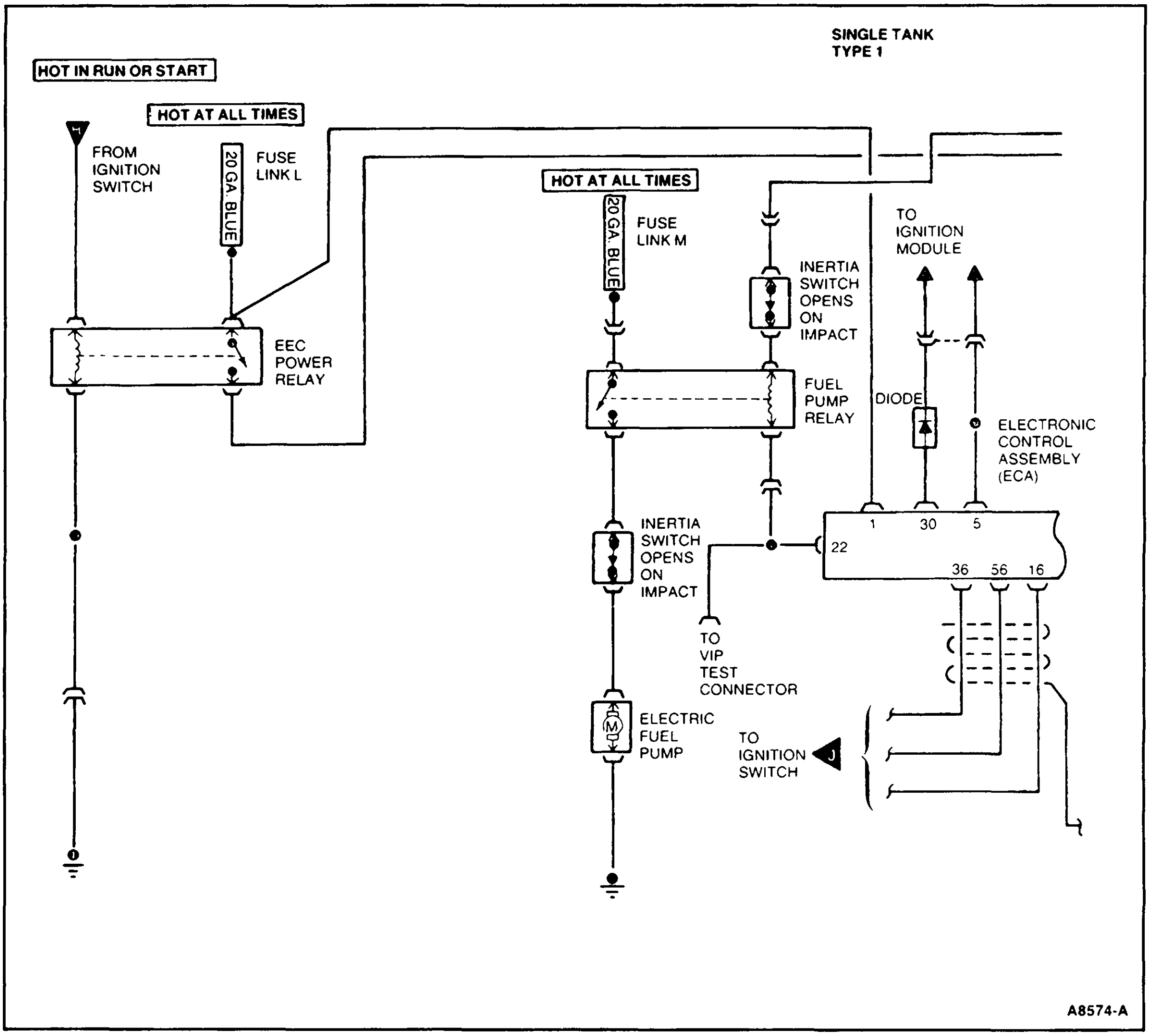
Electric Fuel Delivery System

EFD

Electrical Schematic



VEHICLE APPLICATION

Passenger car EFI/CFI

Aerostar, 1986 1/2 and later model years, EFI

Ranger/Bronco II, 1989 model year, EFI

*Inertia switch located in line with fuel pump on 1989 Bronco II and 1986 1/2-89 Aerostar.

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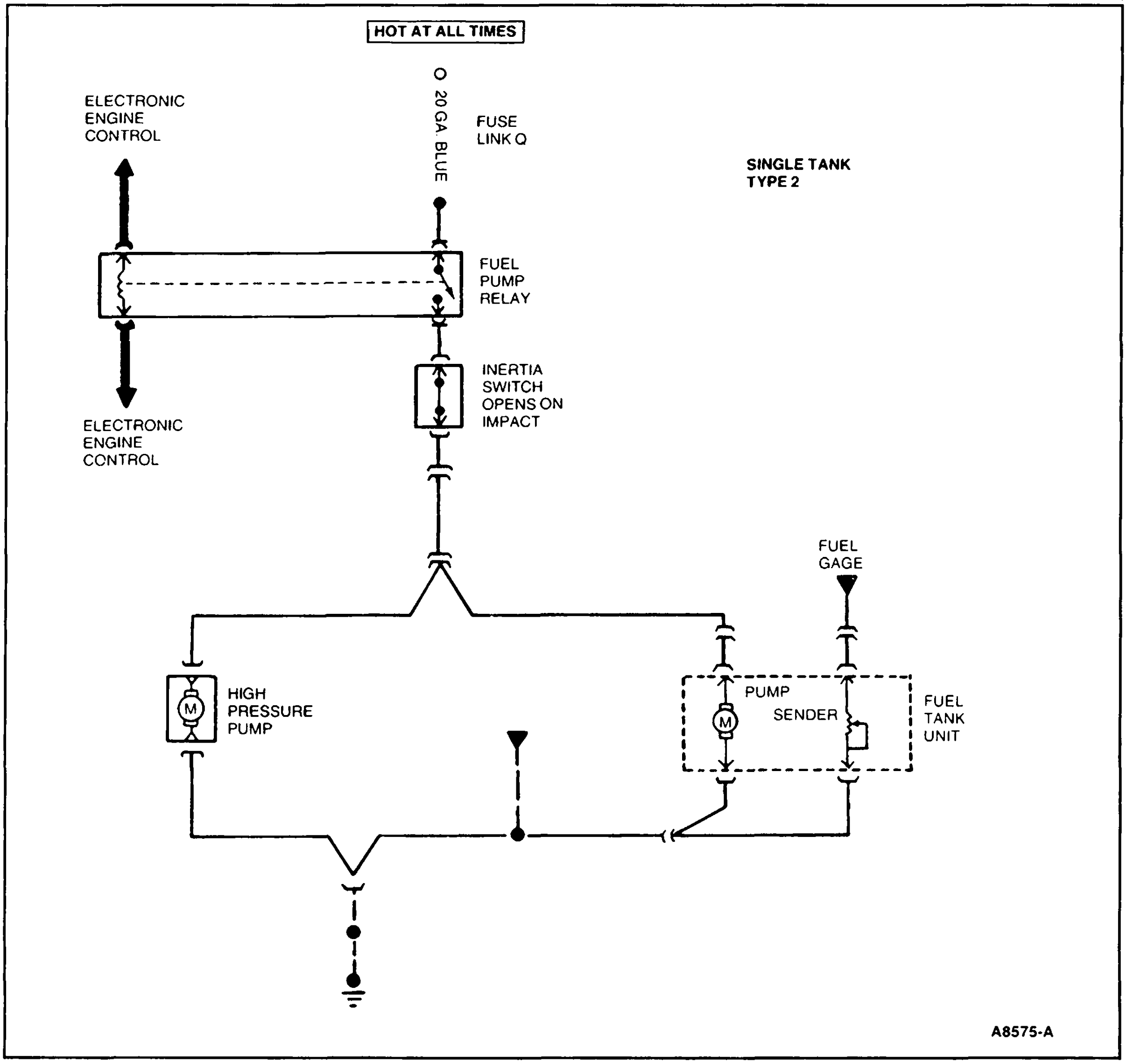
Electric Fuel Delivery System

EFD

Electrical Schematic



VEHICLE APPLICATION

E & F Series, Bronco, 1985 and later model years, EFI
Ranger/Bronco II, 1985-1989 model years, EFI
Aerostar, early 1986 model year, EFI

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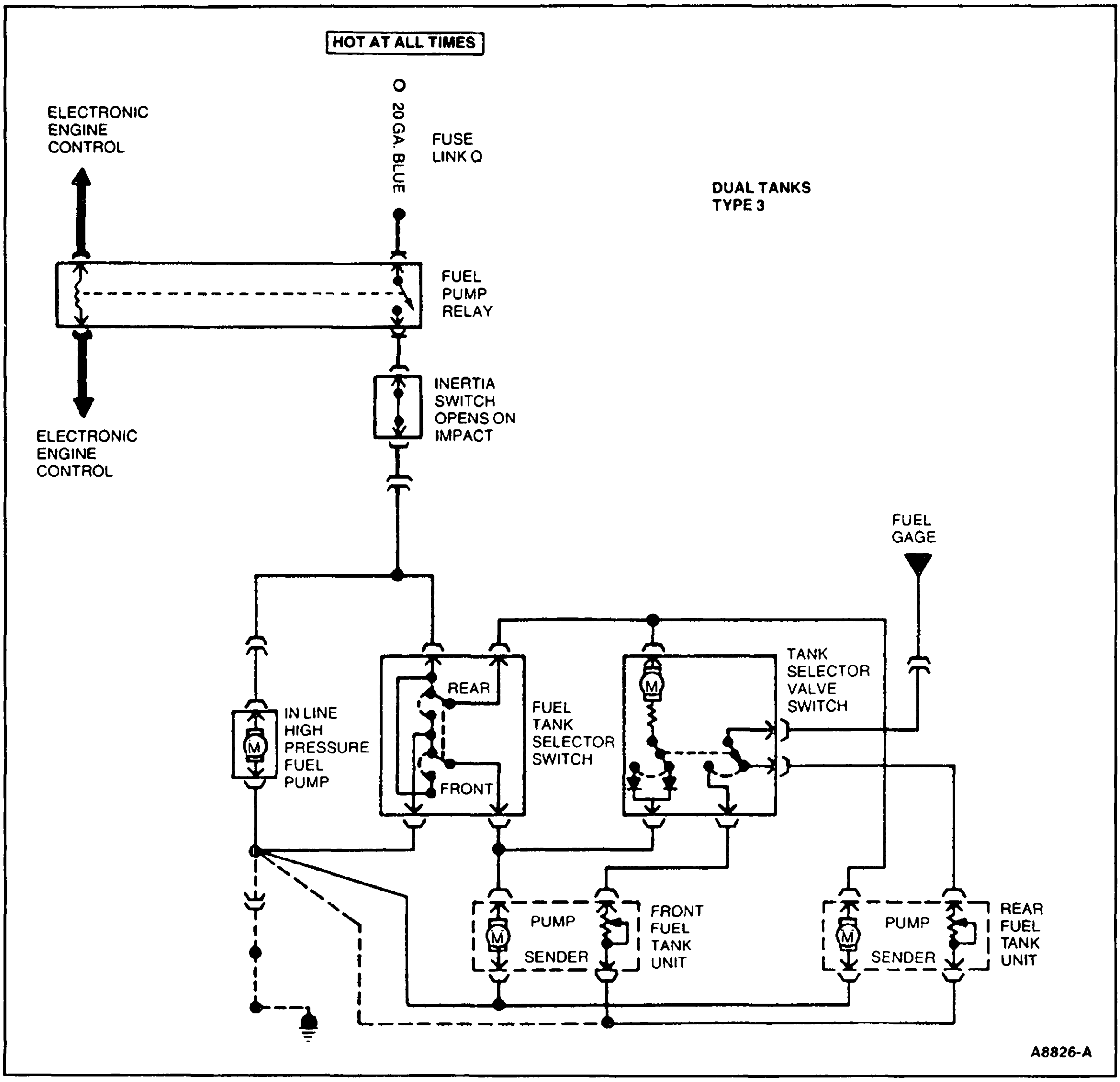
Electric Fuel Delivery System

EFD

Electrical Schematic



VEHICLE APPLICATION

F Series 1985 model year, EFI
E Series 1985-87 model years, EFI
Ranger 1985-88 model years, EFI

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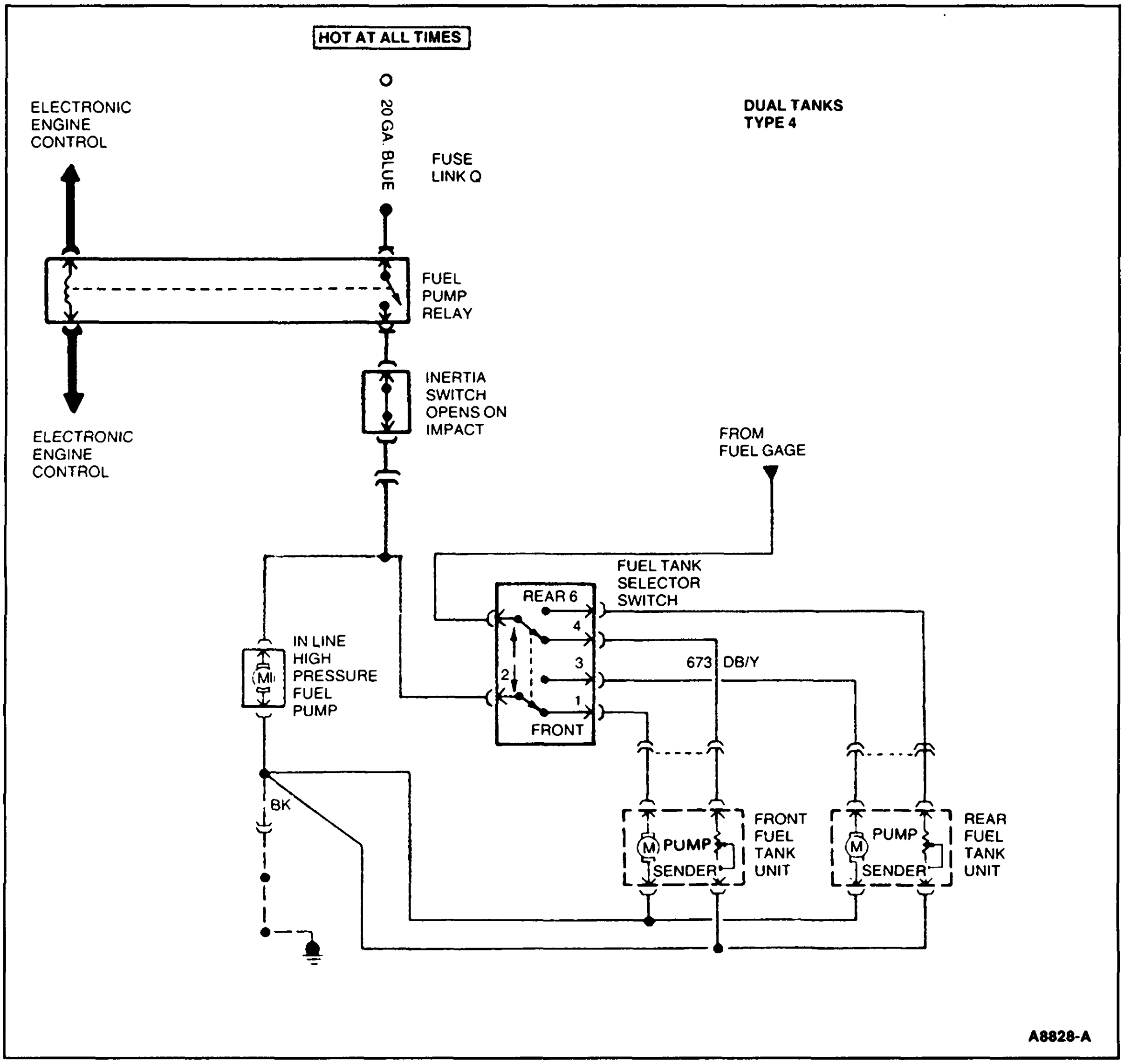
Electric Fuel Delivery System

EFD

Electrical Schematic



VEHICLE APPLICATION
E Series 1988 and later model years, EFI
F Series 1986 and later model years, EFI

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Electric Fuel Delivery System

EFD

FUEL PRESSURE SPECIFICATION TABLE

	1989 PASSENGER CAR ENGINES												
	VALUES ARE IN PSI AND kPa												
	1.9L EFI	1.9L CFI	2.3L OHC EFI	2.3L TC EFI	2.3L HSC EFI	2.5L CFI	3.0L EFI	3.8L FWD EFI	3.8L RWD EFI	5.0L SEFI	5.0L MA SEFI	3.0L SHO SEFI	3.8L SC SEFI
ENGINE RUNNING	30 – 45 PSI	13 – 17 PSI	30 – 45 PSI	30 – 55 PSI	45 – 60 PSI	13 – 17 PSI	30 – 45 PSI	30 – 45 PSI	30 – 45 PSI	30 – 45 PSI	30 – 45 PSI	28 – 33 PSI	30 – 40 PSI
	210 - 310 kPa	90 - 120 kPa	210 - 310 kPa	210 - 345 kPa	310 - 415 kPa	90 - 120 kPa	210 - 310 kPa	210 - 310 kPa	210 - 310 kPa	210 - 310 kPa	210 - 310 kPa	193 - 227 kPa	210 - 280 kPa
KEY ON ENGINE OFF	35 – 45 PSI	13 – 17 PSI	35 – 45 PSI	35 – 45 PSI	50 – 60 PSI	13 – 16 PSI	35 – 45 PSI	35 – 45 PSI	35 – 45 PSI	35 – 45 PSI	35 – 45 PSI	30 – 45 PSI	35 – 40 PSI
	240 - 310 kPa	90 - 120 kPa	240 - 310 kPa	240 - 310 kPa	345 - 415 kPa	90 - 120 kPa	240 - 310 kPa	240 - 310 kPa	240 - 310 kPa	240 - 310 kPa	240 - 310 kPa	20 - 310 kPa	240 - 280 kPa

	1989 LIGHT TRUCK ENGINES						
	VALUES ARE IN PSI AND kPa						
	2.3L EFI	2.9L EFI	3.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.5L EFI
ENGINE RUNNING	30 – 45 PSI	30 – 45 PSI	30 – 45 PSI	45 – 60 PSI	30 – 45 PSI	30 – 45 PSI	30 – 45 PSI
	210 – 310 kPa	210 – 310 kPa	210 – 310 kPa	310 – 415 kPa	210 – 310 kPa	210 – 310 kPa	210 – 310 kPa
KEY ON ENGINE OFF	35 – 45 PSI	35 – 45 PSI	35 – 45 PSI	50 – 60 PSI	35 – 45 PSI	35 – 45 PSI	35 – 45 PSI
	240 – 310	240 – 310 kPa	240 – 310 kPa	345 – 415 kPa	240 – 310 kPa	240 – 310 kPa	240 – 310 kPa

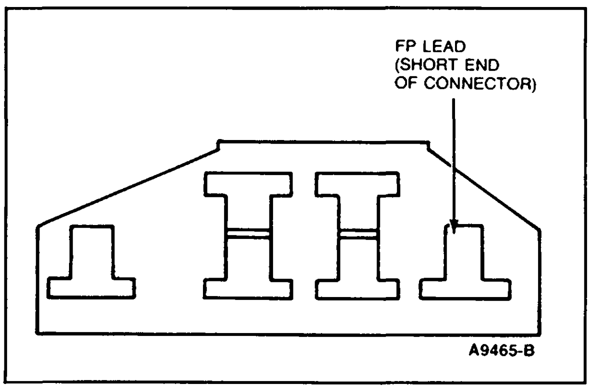

Figure 1 Self Test Connector

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Electric Fuel Delivery System — EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD1 SYSTEM INTEGRITY CHECK (TYPES 1, 2, 3, 4)		
• Visually inspect the complete fuel delivery system, including fuel tank lines, reservoir, filter, pumps, injectors, pressure regulator, battery, electrical lines and connectors for leakage, looseness, cracks, pinching, kinking, corrosion, grounding, abrasion, or other damage caused by accident, collision, assembly or usage. • Verify that the battery is fully charged. • Check the engine fuse integrity. • Check for sufficient fuel in the fuel tanks. • **Is the system free of any evidence of leakage, damage, or any other cause for concern?** **WARNING** **BEFORE SERVICING OR REPLACING ANY COMPONENTS IN THE FUEL SYSTEM, REDUCE THE POSSIBILITY OF INJURY OR FIRE, AS OUTLINED UNDER "WARNING INSTRUCTIONS."**	Yes ▶ No ▶	GO to EFD2 . REPAIR or REPLACE as required.
EFD2 FUEL INJECTION PRESSURE TEST (TYPES 1, 2, 3, 4)		
• Ground the fuel pump lead of the self-test connector through a jumper at the FP lead. • Before releasing fuel system pressure at the Schrader fitting, observe the Warning Instructions to avoid fuel spillage and injury. • Install the fuel pressure tester. • Turn the ignition key to RUN, to operate the fuel pump(s). • Verify that the observed fuel pressure is within specified limits for the engine being checked. • Specification: Fuel System Pressure (Key On, engine Off) Refer to "Fuel Pressure Specification Table." • **Is the fuel injection pressure within specification?**	Yes ▶ No ▶	For type 1 GO to EFD44 . For all other types GO to EFD37 . If zero, GO to EFD3 . If low, GO to EFD26 . If high, GO to EFD35 .

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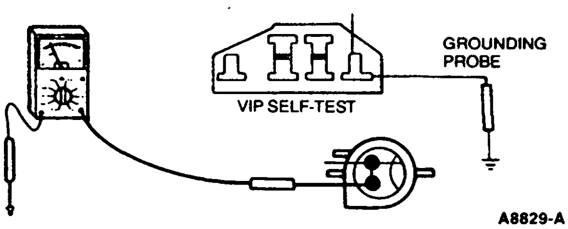
Electric Fuel Delivery System — EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD3 VERIFICATION OF SYSTEM TYPE		
• Verify if vehicle is a single (Type 1) or dual pump (types 2, 3, 4) system. Type 1 - Single Tank, Single Pump. Type 2 - Single Tank, Dual Pump. Type 3 - Dual Tank, Dual Pump Electrical Selector Valve. Type 4 - Dual Tank, Dual Pump Mechanical Selector/Reservoir.	Single Pump (Type 1) ▶ Dual Pump (Types 2, 3, 4) ▶	GO to EFD16. GO to EFD4.
EFD4 VOLTAGE CHECK AT H.P. PUMP (TYPES 2, 3, 4)		
• Ground the fuel pump lead of the VIP Self Test connector as shown. • Ignition switch on. • Engine off. • Battery fully charged. • Disconnect high-pressure fuel pump at connector. • Measure the voltage on the harness side as shown. • **Is the voltage greater than 10.5 volts?** 	Yes ▶ No ▶	GO to EFD5. GO to EFD19.

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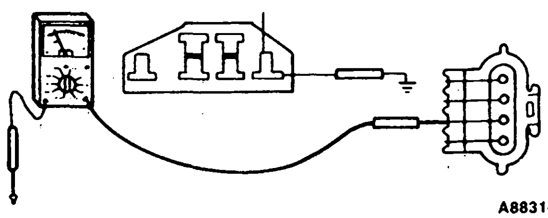
Electric Fuel Delivery System — EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD5 HIGH PRESSURE PUMP GROUND CHECK (TYPES 2, 3, 4)		
• Disconnect high-pressure pump at connector. • Ignition switch off. • Measure the resistance from the black wire to ground as shown. • **Is the resistance less than 5 ohms?**  A8830-A	Yes ▶ No ▶	Go to EFD6. REPAIR black wire from high-pressure pump to ground as required.
EFD6 LOW PRESSURE PUMP VOLTAGE CHECK (TYPES 2, 3, 4)		
• Ground the fuel pump lead of the VIP Self Test connector as shown. • Ignition switch on. • Engine off. • Battery fully charged. • Place selector switch in "F" position if equipped with dual tank. • Disconnect the front fuel tank connector. • Measure the voltage on the power supply lead to fuel pump as shown. • Is the voltage greater than 10.5 volts? • Repeat procedure with selector switch in "R" position and measure voltage at rear tank sender/pump unit connector.  A8831-A	Yes ▶	GO to EFD9. For type 4 GO to EFD7. For type 3 GO to EFD12. For type 2 REPAIR wire from low pressure fuel pump to inertia switch as required.

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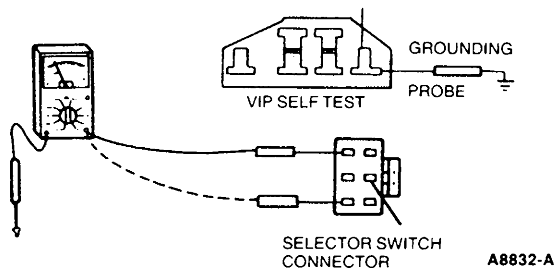
Electric Fuel Delivery System

EFD

TEST STEP		RESULT ▶	ACTION TO TAKE
EFD7	VOLTAGE CHECK AT SELECTOR SWITCH (TYPE 4)		
	• Ground fuel pump lead of the VIP Self Test connector as shown. • Ignition switch on. • Engine off. • Battery fully charged. • Place selector switch in "F" position • Measure voltage at pin 1 of the selector switch as shown. • Is the voltage greater than 10.5 volts? • Repeat with selector switch in "R" position for AFT axle tank and measure voltage on Pin 3 as shown. 	Yes ▶ No ▶	REPAIR wire from selector switch to front tank pump. GO to **EFD8**.

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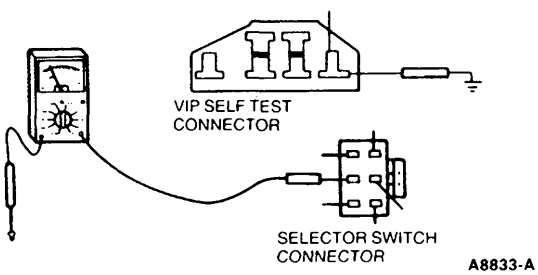
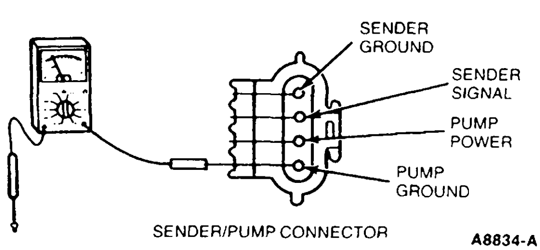
Electric Fuel Delivery System

EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD8 VOLTAGE CHECK OF SUPPLY TO SELECTOR SWITCH (TYPE 4)		
• Ground fuel pump lead of the VIP Self Test connector as shown. • Ignition switch on. • Engine off. • Battery fully charged. • Disconnect selector switch. • Measure voltage at Pin 2 of selector switch as shown. • **Is the voltage greater than 10.5 volts?**  	Yes ▶ No ▶	REPLACE selector switch. SERVICE wire from selector switch to inertia switch.
EFD9 LOW PRESSURE PUMP(S) GROUND CHECK (TYPES 2, 3, 4)		
• Disconnect connector from front fuel tank. • Ignition switch off. • Measure the resistance from the tank connector to ground as shown. • **Is the resistance less than 5 ohms?** • Repeat for rear tank.  	Yes ▶ No ▶	For types 2 and 4 GO to $\boxed{\text{EFD27}}$. For type 3 GO to $\boxed{\text{EFD10}}$. REPAIR wire from fuel pump/sender connector to ground.

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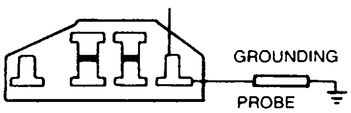
Electric Fuel Delivery System

EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD10 FUEL PUMP(S) OPERATIONAL AUDIBLE CHECK (TYPES 2, 3, 4)		
• Ground the fuel pump lead of the VIP Self Test connector as shown. • Verify that there is a good connection to the fuel pump/sender unit. • Ignition switch on. • Engine off. • Battery fully charged. • Listen to fuel pump(s). • **Are the fuel pump(s) running?**	Yes ▶	For type 3 GO to EFD11 . For type 4 GO to EFD27 .
	No ▶	REPAIR fuel pump/ sender unit.



A8835-A

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD11 SELECTOR VALVE FUNCTION CHECK (TYPE 3)		
• Remove selector valve from vehicle. • Verify selector valve operation by chart shown. • **Does the selector valve operate properly?**	Yes ▶	GO to EFD27 .
	No ▶	REPLACE selector valve.

Valve Position	Selector Valve Elec. Table					Fuel Flow		
	Apply Voltage At Pins		Measure Resistance On Pins			Check Flow of Ports		
	1	2	3	4	5	Front Port	Pump Port	Rear Port
Front	(−)	(+)	Less than 1.0 OHM		Open	Connected		Blocked
Rear	(+)	(−)	Open	Less Than 1.0 Ohm		Blocked	Connected	

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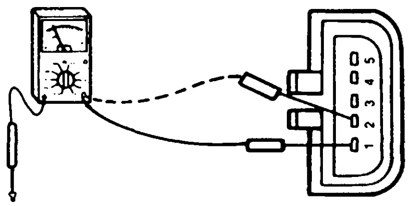
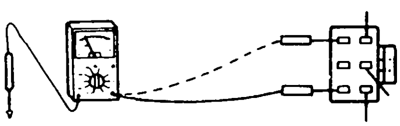
Electric Fuel Delivery System

EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD12 VOLTAGE CHECK AT SELECTOR VALVE (TYPE 3)		
• Battery fully charged • Ground the fuel pump lead of the VIP Self Test Connector. • Selector switch in front position. • Disconnect selector valve connector. • Key on, engine off. • Measure voltage on Pin 1 at selector valve as shown. • Measure resistance from Pin 2 to ground as shown. • **Is the voltage greater than 10.5 volts and the resistance less than 1 ohm?** • Repeat with selector switch in rear position and measure voltage on Pin 2 of the selector valve/ switch and resistance from Pin 1 to ground.  A8879-A	Yes ▶ No ▶	REPAIR wire(s) from selector valve/switch to low pressure pump. REPAIR ground wire circuit to selector switch, and/or go to EFD13 .
EFD13 VOLTAGE CHECK AT SELECTOR SWITCH (TYPE 3)		
• Battery fully charged. • Ground fuel pump lead of the VIP Self Test connector. • Key on, engine off. • Selector switch in front position. • Measure voltage on Pin 2 at the fuel tank selector switch as shown. • **Is the voltage greater than 10.5 volts?** • Repeat with switch in rear position and measure voltage on Pin 1 selector switch as shown.  A8880-A	Yes ▶ No ▶	REPAIR wire(s) from selector switch to selector valve. GO to EFD14 .

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Electric Fuel Delivery System

EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD14 RESISTANCE CHECK AT SELECTOR SWITCH (TYPE 3)		
• Key off. • Disconnect selector switch from harness. • Check resistance from selector switch connector to ground as shown. • **Is the resistance less than 1 ohm?**  A8881-A	Yes ▶ No ▶	GO to EFD15 . REPAIR open wire from switch to ground.
EFD15 VOLTAGE CHECK AT SELECTOR SWITCH (TYPE 3)		
• Ground fuel pump lead of the VIP Self Test connector. • Key on, engine off. • Measure the voltage at the selector switch as shown. • **Is the voltage greater than 10.5 volts?**  A8882-A	Yes ▶ No ▶	REPLACE switch. REPAIR wire from inertia switch to selector switch.
EFD16 PUMP OPERATION CHECK, AUDIBLE (TYPE 1)		
• Battery fully charged. • Ground the fuel pump lead of the VIP Self Test connector. • Verify that a good connection is made to the pump/sender unit. • Key on, engine off. • Listen to fuel pump. • **Is the fuel pump running?**	Yes ▶ No ▶	GO to EFD27 . GO to EFD17 .

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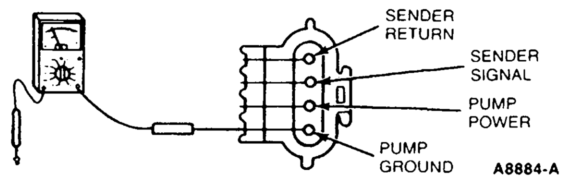
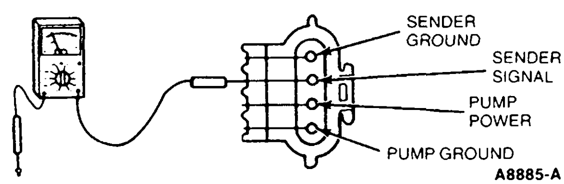
Electric Fuel Delivery System

EFD

TEST STEP		RESULT ▶	ACTION TO TAKE
EFD17	HIGH-PRESSURE PUMP GROUND CHECK (TYPE 1)		
• Key off. • Disconnect pump/sender unit connector. • Measure the resistance of the wire to ground as shown. • **Is the resistance less than 1 ohm?**  		Yes ▶ No ▶	GO to EFD18 . REPAIR open wire to ground.
EFD18	VOLTAGE CHECK AT HIGH-PRESSURE PUMP (TYPE 1)		
• Disconnect pump/sender assembly connector. • Battery fully charged. • Ground the fuel pump lead of the VIP Self Test connector. • Key on, engine off. • Measure the voltage at the fuel pump/sender unit as shown. • **Is the voltage greater than 10.5 volts?**  		Yes ▶ No ▶	REPLACE pump/sender assembly. GO to EFD19 .

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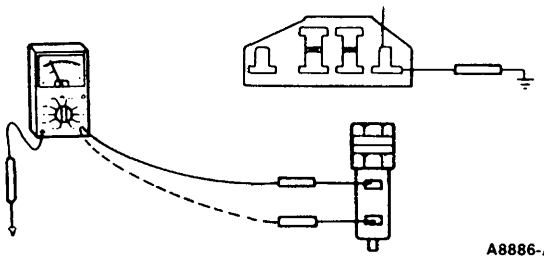
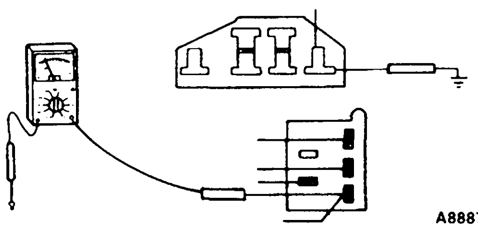
Electric Fuel Delivery System

EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD19 VOLTAGE CHECK AT INERTIA SWITCH (ALL TYPES)		
o Battery fully charged. o Ground fuel pump lead of the VIP Self Test connector as shown. o Ignition switch on. o Engine off. o Inertia switch plugged in. o Measure the voltage at the inertia switch as shown. o Is the voltage greater than 10.5 volts at both pins? o Repeat for opposite pin of inertia switch as shown.  A8886-A	Yes ▶ No ▶	REPAIR the wire from the inertia switch to the high-pressure pump. RESET or REPLACE inertia switch as required. GO to EFD20 .
EFD20 VOLTAGE CHECK AT SWITCHED SIDE OF F.P. RELAY (ALL TYPES)		
o Ground fuel pump lead of the VIP Self Test connector as shown. o Ignition switch on. o Engine off. o Battery fully charged. o Measure the voltage at the fuel pump relay as shown. o **Is the voltage greater than 10.5 volts?**  A8887-A	Yes ▶ No ▶	REPAIR brown wire from fuel pump relay to inertia switch. GO to EFD21 .

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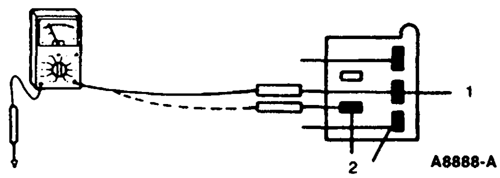
Electric Fuel Delivery System

EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD21 POWER SUPPLY CHECK TO F.P. RELAY (ALL TYPES)		
• Disconnect fuel pump relay. • Battery fully charged. • Ignition switch on, engine off. • Measure the voltage on the red, and black/yellow or yellow wires of the fuel pump relay connector as shown. • **Is the voltage on these wires greater than 10.5 volts?** 	Yes ▶	GO to EFD23 .
	Red No ▶	REPAIR wire from fuel pump relay to EEC power relay.
	Yellow No ▶	GO to EFD22 .
	Black/yellow No ▶	REPAIR black/yellow wire from Power Distribution Box to Fuel Pump Relay and/or REPLACE 30 amp high current fuse in Power Distribution Box (position no. 1).
EFD22 VOLTAGE CHECK AT PIN 1 OF EEC-IV (ALL TYPES)		
• Battery fully charged. • Ignition switch off. • Remove EEC-IV processor. • Install EEC-IV breakout box, Rotunda Tool Number T83L-50-EEC-IV or EEC-IV Monitor, Rotunda Tool Number 007-00018. • Measure the voltage at Pin 1 of the breakout box. - or - • With EEC-IV Monitor install the appropriate overlay according to engine and year. • Place selector switch "A" on the arrow that points at selector switch "B". Place selector switch B on KAPWR1. Turn EEC-IV Monitor power on, read the voltage of pin 1 on the LCD display. • **Is the voltage greater than 10.5 volts?**	Yes ▶	REPAIR wire from fuel pump relay to battery (+).
	No ▶	GO to Quick Test, Section 14.

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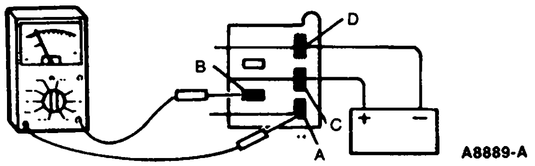
Electric Fuel Delivery System — EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD23 FUEL PUMP RELAY OPERATION CHECK (ALL TYPES)		
• Remove relay from vehicle. • Connect a +12v supply to terminal "C" as shown. • Ground terminal "D" as shown. • Measure the resistance between terminals "A" and "B" as shown. • **Is the resistance lower than 1 ohm with the power applied and greater than 10,000 ohms with power removed from terminal "C"?** 	Yes ▶ No ▶	GO to EFD24 . REPLACE fuel pump relay.
EFD24 VOLTAGE CHECK AT PIN 22 (ALL TYPES)		
• Battery fully charged. • Remove EEC-IV processor. • Install breakout box, Rotunda Tool Number T83L-50-EEC-IV, or EEC-IV Monitor, Rotunda Tool Number 007-00018 or equivalent. • Ignition switch on. • Measure the voltage on Pin 22 of the breakout box. - or - • With the EEC-IV Monitor, install the appropriate overlay according to engine size and year. Place selector switch "A" on Pin 22, "FP", turn EEC-IV Monitor power on and read voltage on Pin 22 from LCD readout. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to Quick Test, Section 14. GO to EFD25 .

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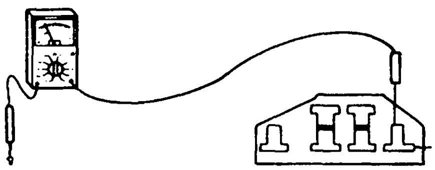
Electric Fuel Delivery System

EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD25 VOLTAGE CHECK AT T/LG WIRE ON VIP (ALL TYPES)		
• Battery fully charged. • Engine off. • EEC-IV processor disconnected. • Ignition on. • Measure the voltage on the fuel pump lead of the VIP Self Test connector as shown. • **Is voltage above 10.5 volts?**  A8890-A	Yes ▶ No ▶	REPAIR Tan/Light Green wire from EEC-IV to fuel pump relay. REPAIR Tan/Light Green wire from fuel pump relay to EEC-IV and from fuel pump relay to VIP connector.
EFD26 FUEL PUMP LOW VOLTAGE CHECK (TYPES 1, 2, 3, 4)		
• Ground the FP lead of the self test connector using a jumper, as in Test Step EFD2. • Connect the DVOM at the high-pressure fuel pump terminal (PK/BK). • **Is the voltage at the fuel pump within 0.5 volt of the battery?**	Yes ▶ No ▶	GO to EFD27. GO to EFD3.
EFD27 HIGH-PRESSURE FUEL FILTER CONDITION CHECK (TYPES 1, 2, 3, 4)		
• Observe Warning-Instructions to avoid fuel spillage and injury. • Check the condition of the high-pressure fuel filter and check the customers service records versus the maintenance schedule. • Types 2 and 3 systems, check also the condition of the fuel filter contained in the in-line reservoir, if so equipped. • **Is the fuel filter free of contamination and blockage?**	Yes ▶ No ▶	CFI systems GO to EFD48. EFI system GO to EFD28. SERVICE the filter(s) and RERUN test EFD2.

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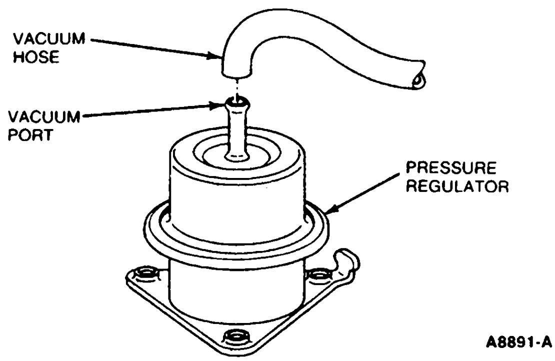
Electric Fuel Delivery System Fuel Pressure Regulator (EFI)

EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD28 PRESSURE REGULATOR DIAPHRAGM CONDITION CHECK (TYPES 1, 2, 3, 4)		
• Connect the Fuel Pressure Test Kit at the Schrader fitting on the rail. Observe Warning-Instructions to avoid fuel spillage and injury. • Start engine and run for 10 seconds. • Stop engine and wait 10 seconds. • Start engine and run for 10 seconds. • Stop engine and remove the vacuum hose from the pressure regulator. • Examine the vacuum port in the pressure regulator for evidence of fuel leakage through the diaphragm. • **Is the vacuum port free of any fuel?**	Yes ▶ No ▶	GO to EFD29 . REPLACE the pressure regulator, and RERUN test EFD2 .



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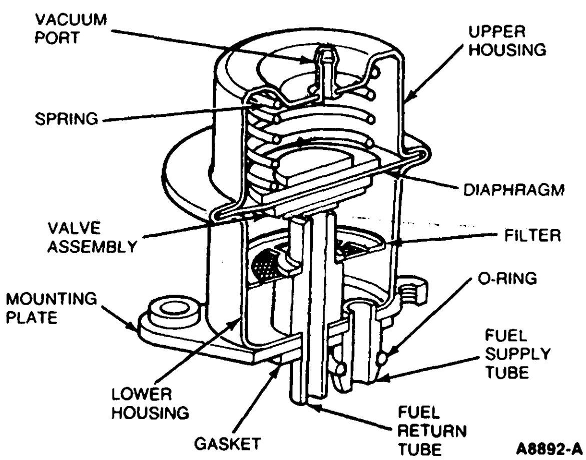
Electric Fuel Delivery System
Fuel Pressure Regulator (EFI)

EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD29 PRESSURE REGULATOR FUEL PRESSURE LEAKDOWN CHECK (TYPES 1, 2, 3, 4)		
• With the Fuel Pressure Test Kit still installed on the engine, run the engine for 30 seconds minimum. • Stop the engine and observe the fuel pressure. • **Does fuel pressure drop 34 kPa (5 psi) maximum after 60 seconds?**	No ▶	GO to EFD30 .
	Yes ▶	REPEAT this test step if fuel pressure still drops, REPLACE the regulator.
EFD30 PRESSURE REGULATOR VALVE SEAT LEAKAGE CHECK (TYPES 1, 2, 3, 4)		
• Observe the Warning-Instructions to avoid fuel spillage and injury. • Remove the fuel pressure regulator. • Inspect the O-ring and the gasket and mounting surfaces for cracks, cuts or other defects that may affect sealing. • Connect the vacuum tester to the fuel return tube (shown below) and apply a 20 in-Hg vacuum. • Verify whether the vacuum retention meets specification of 10 in-Hg maximum loss of vacuum within 10 seconds. • **Does the vacuum drop below 10 in-Hg with 10 seconds?**	Yes ▶	REPLACE the regulator rerun test no. EFD2 .
	No ▶	GO to EFD31 .



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Electric Fuel Delivery System — EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD31 FUEL SYSTEM LEAKAGE RE-CHECK (TYPES 1, 2, 3, 4)		
• If it is necessary to disconnect any fuel lines, observe the Warning-Instructions to avoid fuel spillage and injury. • Re-inspect the complete fuel delivery system, components, and lines for fuel leakage, pinching, or kinking that may cause low fuel pressure, as evidenced by fuel odor, spillage, stains, or damage caused by accident or collision. • **Is the fuel delivery system free of any apparent defects that may cause low fuel pressure?**	Yes ▶	For type 1 GO to EFD33 . All other types GO to EFD32 .
	No ▶	REPAIR or REPLACE components as required. RERUN test step EFD2 .
EFD32 LOW PRESSURE (IN-TANK) FUEL PUMP FLOW CHECK (TYPES 2, 3, 4)		
• Observe the Warning-Instructions to avoid fuel spillage and injury. • Connect a jumper to the FP lead of the self-test connector, and long enough to reach the work area under the vehicle when it is raised. • Turn ignition key to RUN position. • Raise vehicle on a hoist and bring the test lead to a convenient point for grounding. • Disconnect the pump pressure line at the reservoir inlet fitting and place it in a measuring vessel of at least one quart capacity. • Ground the test lead, verify that the pump is running, using a stethoscope if necessary, and that the pump flow meets specification. • Fuel flow specification: 180 m1 (6 oz) per 5 seconds. • **Does the pump flow meet the specification?**	Yes ▶	GO to EFD34 .
	No ▶	Pump not running GO to EFD6 . Flow does not meet specification-SERVICE pump inlet filter or REPLACE pump as required. RERUN test step EFD2 .

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Electric Fuel Delivery System

EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD33 HIGH-PRESSURE (IN-TANK) FUEL PUMP FLOW CHECK (TYPE 1)		
• Observe the Warning-Instructions to avoid fuel spillage and injury. • Disconnect the fuel return line at the fuel rail and connect the fuel pressure testing kit. • Provide a measuring vessel (1 qt. capacity) and overflow vessel for measuring fuel flow through the test kit. • Connect a jumper to the FP lead of the self-test connector. • Turn the ignition key to RUN position. • Ground the jumper to run the fuel pump. • Collect the fuel flow into the measuring vessel for 15 seconds. • **Is the fuel flow approximately 250 ml (8.3 oz) per 15 seconds?**	Yes ▶ No ▶	GO to EFD34 . SERVICE pump inlet screen and rerun test. REPLACE pump as required. RERUN test step EFD2 .
EFD34 HIGH-PRESSURE PUMP CHECK VALVE LEAKDOWN CHECK (TYPES 1, 2, 3, 4)		
• Observe Warning-Instructions to avoid fuel spillage and injury. • Connect the fuel pressure test kit at the fuel pressure test point. • Connect a jumper to the FP lead of the self-test connector. • Turn ignition key to RUN position. • Ground the test lead using the jumper wire to run the fuel pump. • Run the fuel pump for 30 seconds minimum. • Remove the test lead ground and note pressure on the gauge. • Verify whether the fuel pressure remains within the specified 2 psi for 3 minutes after the test lead is ungrounded. • **Does the fuel pressure remain within 2 psi for 3 minutes after the test lead is ungrounded?**	Yes ▶ No ▶	If leakdown rate OK For type 1 GO to EFD44 . All other types GO to EFD37 . REPLACE pump. RERUN test step EFD2 .

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Electric Fuel Delivery System

EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD35 PRESSURE REGULATOR CHECK FOR HIGH PRESSURE CAUSES (TYPES 1, 2, 3, 4)		
o Observe the Warning-Instructions to avoid fuel spillage and injury. o Check leaks in the engine vacuum system due to loose or mis-threaded fittings, cracks, cuts, pinches, or kinks in vacuum lines, or blockages that could cause insufficient vacuum to properly control the pressure regulator. o Check the pressure regulator housing for damage or dents that could cause a higher spring load on the pressure regulator diaphragm. o Check the integrity of the pressure regulator diaphragm per the procedure of test step EFD28 . o **Is the fuel system free of defects that could cause the pressure regulator to produce excessive fuel injection pressure? (Refer to Fuel pressure Specification in this Section).**	Yes ▶ No ▶	REPLACE the regulator with a known good regulator. RERUN test step EFD2 . If pressure still high, GO to EFD36 . REPAIR or REPLACE damaged components as required. RERUN test step EFD2 . Proceed with above Action for "yes" result.
EFD36 FUEL RETURN SYSTEM CHECK FOR HIGH PRESSURE CAUSES (TYPES 1, 2, 3, 4)		
o Observe the Warning-Instructions to avoid fuel spillage and injury. o Remove the fuel return line at the pressure regulator and at the fuel tank(s). o Provide a suitable fuel receptacle at the tank end(s) of the return lines to avoid fuel spillage. o Check the fuel return system(s) for restriction due to blockage, kinking, or pinching by blowing through it with 5-10 psi regulated shop air. If the system is Type 3 or 4 (dual tanks) switch the fuel selector switch so as to check both return lines. o **Is the fuel return system free of any restriction that could cause excessive fuel injection pressure?**	Yes ▶ No ▶	For type 1 GO to EFD47 . All other types GO to EFD37 . REPAIR defects, CLEAN or REPLACE faulty components as required to remove the causes of high pressure. PROCEED with Action for above "yes" result.

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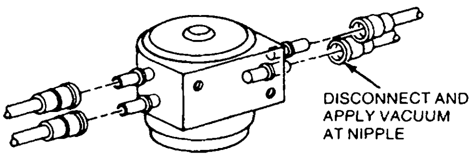
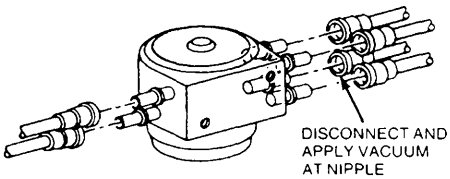
EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD37 FUEL RESERVOIR ANTI-SIPHON VALVE FUNCTION CHECK (TYPES 2, 3, 4)		
• This test step applies only to Light Truck fuel systems, types 2, 3, and 4 having the in-line reservoir. • Observe the Warning-Instructions to avoid fuel spillage and injury. • Disconnect the fuel supply line entering the reservoir: For type 2 - from the tank For type 3 - from the electric selector valve For type 4 - from the rear tank • Selector switch in rear tank position (for type 4 system). • Connect the vacuum tester to the same reservoir fuel supply nipple on the reservoir. • Apply a 10 in-Hg vacuum maximum to the fuel supply nipple and observe the vacuum gauge. CAUTION **Any vacuum higher than 10 in-Hg may rupture the diaphragm of the type 4 system reservoir.** • **Does the anti-siphon valve retain a 10 in-Hg vacuum?**	Yes ▶ No ▶	For type 2 GO to EFD44. For type 3 GO to EFD38. For type 4 GO to EFD39. REPLACE the reservoir.



TYPES 2 AND 3 - Fuel Reservoir



TYPE 4 - Fuel Reservoir

A8893-A

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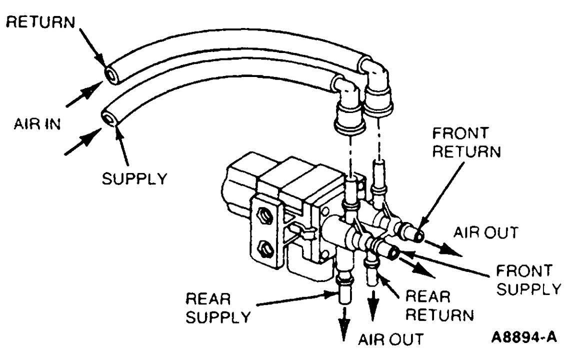
Electric Fuel Delivery System

EFD

TEST STEP		RESULT ▶	ACTION TO TAKE
EFD38	ELECTRIC SELECTOR VALVE FUNCTION CHECK (TYPE 3)		
	o Observe Warning-Instructions to avoid fuel spillage and injury. CAUTION **To avoid fuel spillage when the selector switch is moved from one tank to the other, disconnect the electrical connections at both in-tank fuel pumps.** o Disconnect all fuel supply lines (3) and return lines (3) from the selector valve. o Prepare two lengths of test hose, fitted with Quick Connectors to fit the selector valve nipples (to avoid nipple damage), one for the supply side nipples, and the other for the smaller return nipples. o Using shop air regulated to 3-5 psi, connect the test hoses to the engine supply and return nipples, check the airflow paths when the selector switch is moved from rear to front tank and vice-versa, and verify that the selector valve functions correctly. o **Does the selector valve function correctly?**	Yes ▶ No ▶	GO to EFD44 . GO to EFD11 .



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Electric Fuel Delivery System | EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD39 MECHANICAL SELECTOR VALVE/RESERVOIR CHECK (TYPE 4)		
For test steps EFD39 and 40. CAUTION **To avoid fuel spillage with the fuel lines disconnected, disconnect the electric connectors at both in-tank fuel pumps.** • The following test steps (EFD39 and 40) are required for checking correct function of the mechanical selector valve which is integral with the 6 nipple reservoir. The valve is not serviceable. • Remove lines from valve, noting position of lines for correct reinstallation. • Provide test hoses as described for test step EFD38 to avoid nipple damage. • Provide shop air reduced to 3-5 PSI AND REGULATED. Air pressure of 2 psi will operate the valve, but PRESSURE GREATER THAN 5 PSI MAY RUPTURE THE INTERNAL DIAPHRAGM. • Apply 3-5 psi air pressure to engine (front) side return (smaller size) nipple, and check whether air exits from either fuel return port on the rear (tank) side of the unit. • **Does air exit from either of the tank side return ports?**	Yes ▶ No ▶	GO to EFD40 . Verify the valve is not in a neutral position.

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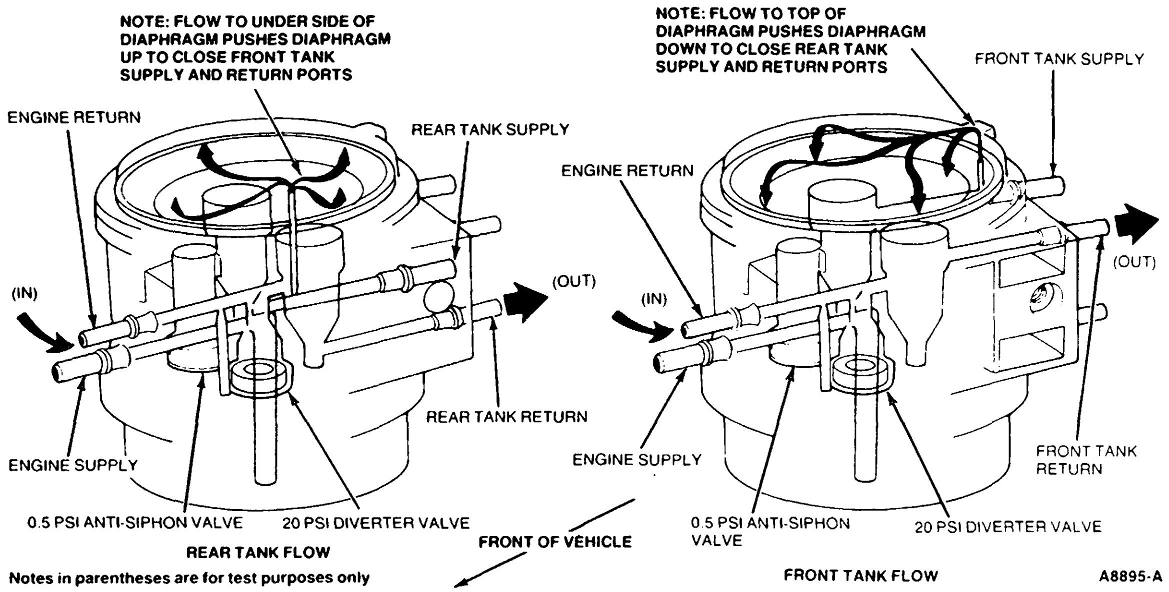
EFD

TEST STEP		RESULT ▶	ACTION TO TAKE
EFD39	MECHANICAL SELECTOR VALVE/RESERVOIR CHECK (STEP 4) CONTINUED		



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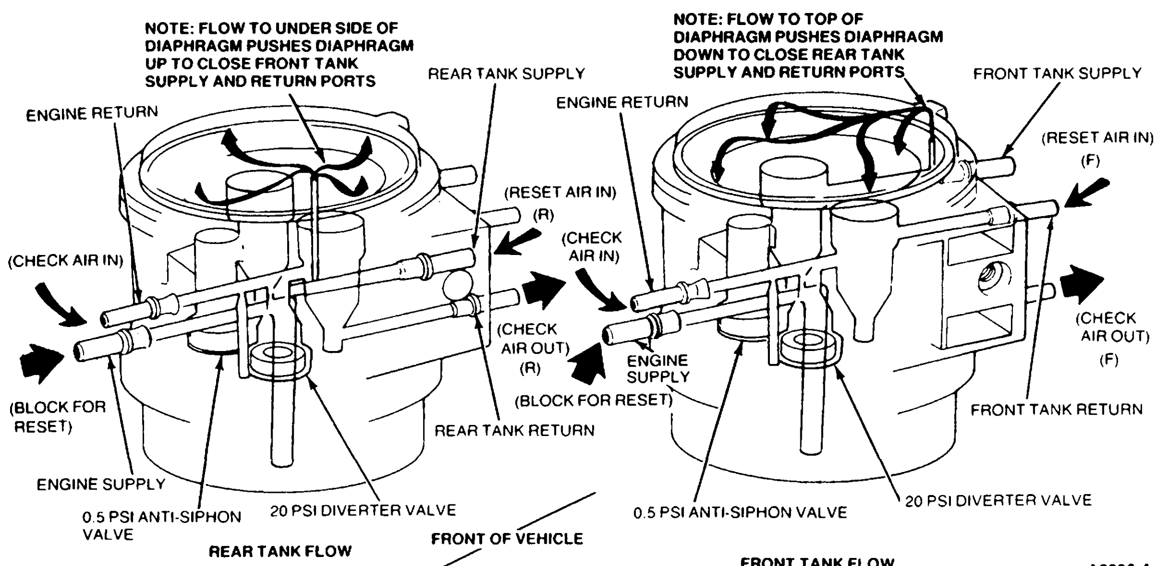
Electric Fuel Delivery System | EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD40 MECHANICAL SELECTOR VALVE/RESERVOIR RESET VALVE (TYPE 4)		
• Block fuel supply port (larger nipple) on engine side of unit. • Apply 3-5 psi air pressure to one (F) and then the other (R) tank side supply ports until a clicking sound is heard or felt, indicating a reset. • Remove air from supply port, apply it to the engine side return port and check whether air exits from the tank side return port corresponding to the final supply port after click. • **Does air exit only from the correct (corresponding) tank side return port?**	Yes ▶ No ▶	GO to EFD41 . REPLACE the Mechanical Selector Valve Reservoir (valves stuck).



Notes in parentheses are for test purposes only

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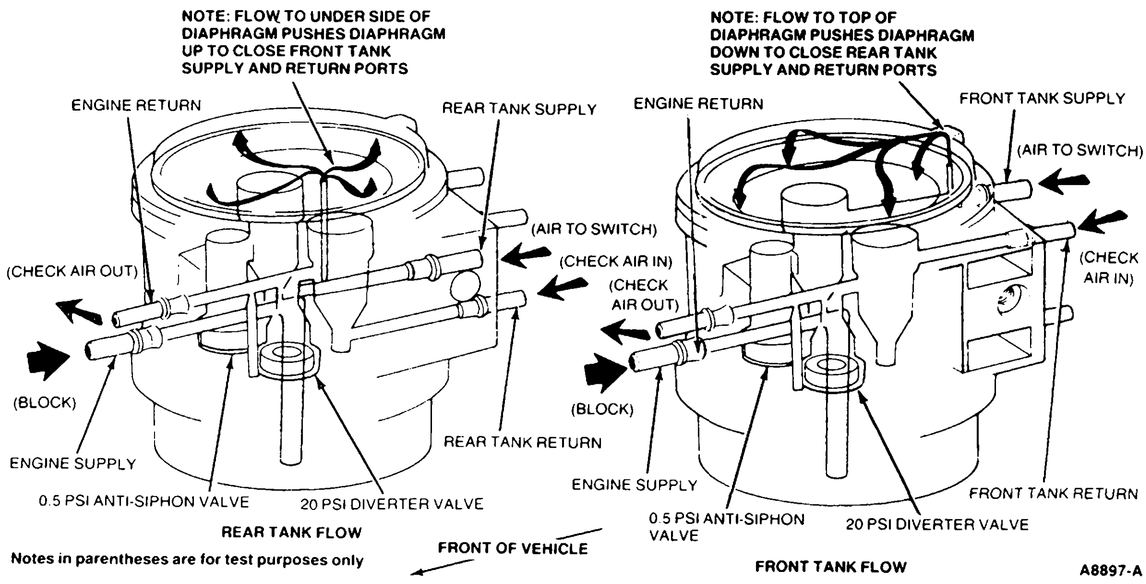
Electric Fuel Delivery System | EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD41 MECHANICAL SELECTOR VALVE/RESERVOIR SWITCHING ACTION CHECK (TYPE 4)		
o Block engine side supply port. o Apply 3-5 psi air pressure to the other tank side supply port from the preceding test step, and note a clicking sound when the valve switches to the new selected tank supply pressure. o Remove 3-5 psi air pressure from the supply port, apply it to the corresponding tank side return port and note whether air exits from the engine side return port. o **Does air exit from the engine side return port?**	Yes ▶ No ▶	GO to EFD42 . RE-CHECK test step EFD41 front and rear tank ports alternately. If unit still fails test, REPLACE the Mechanical Selector Valve Reservoir.



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Electric Fuel Delivery System

EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD42 MECHANICAL SELECTOR VALVE/RESERVOIR SUPPLY SIDE LEAKAGE CHECK (TYPE 4)		
• Remove any previously applied blockages. • Apply 3-5 psi pressure to the engine side supply port and note which tank side supply port is open. • Block the open tank side supply port. • Connect the vacuum and pressure tester to the closed tank side supply port and note any pressure on the gauge with air pressure applied. • **Is the supply side free of any internal valve leakage (zero reading on pressure gauge)?**	Yes ▶ No ▶	GO to EFD43 . REPLACE unit.
EFD43 MECHANICAL SELECTOR VALVE/RESERVOIR RETURN SIDE LEAKAGE CHECK (TYPE 4)		
• Remove any previously applied blockages. • Apply 3-5 psi pressure to the engine side return port and note which tank side return port is open. • Block the open tank side return port. • Connect the vacuum and pressure tester to the closed tank side return port and note any pressure on the gauge with air pressure applied. • **Is the return side free of any internal valve leakage (zero reading on pressure gauge)?**	Yes ▶ No ▶	GO to EFD44 . REPLACE the selector valve.
EFD44 FUEL INJECTOR FUNCTION CHECK (TYPES 1, 2, 3, 4)		
• With the engine warmed and idling (or cranking it if does not start) and using a mechanics' stethoscope or equivalent, listen for regularly spaced operating sounds at each fuel injector. • **Is operating sound present?**	Yes ▶ No ▶	GO to EFD47 . GO to EFD45 .

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Electric Fuel Delivery System

EFD

TEST STEP		RESULT ▶	ACTION TO TAKE
EFD45	FUEL INJECTOR RESISTANCE CHECK (TYPES 1, 2, 3, 4)		
	• Observe the Warning-Instructions to avoid fuel spillage and injury. • Remove the fuel injectors from the engine, if required. • Check the electrical resistance of each injector, using the DVOM, refer to resistance chart. • **Are all the injectors within the resistance specification?**	Yes ▶ No ▶	GO to EFD46 . REPLACE the faulty injectors, RERUN test step EFD44 , and if OK, GO to test step EFD47 .

SINGLE INJECTOR RESISTANCE

SPECIFICATION TABLE

1.9L EFI	1.9L CFI	2.3L OHC EFI	2.3L TC EFI	2.3L HSC EFI	2.5L CFI	3.0L EFI	3.8L FWD EFI	3.8L RWD EFI	3.8L S.C. SEFI	3.0L SHO SEFI	5.0L SEFI	5.0L MA SEFI
2.0 TO 2.7	1.0 TO 2.0	15.0 TO 19.0	2.0 TO 3.0	13.5 TO 16.0	1.0 TO 2.0	15.0 TO 18.0	13.5 TO 16.0	13.5 TO 16.0	13.5 TO 16.0	13.5 TO 16.0	13.5. TO 19.0	1.5 TO 19.0

LIGHT TRUCK ENGINES						
VALUES ARE IN OHMS						
2.3L EFI	2.9L EFI	3.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.5L EFI
13.5 TO 18.0	13.5 TO 18.0	15.0 TO 18.0	13.5 TO 18.0	13.5 TO 18.0	13.5 TO 18.0	13.5 TO 19.0

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Electric Fuel Delivery System — EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD46 FUEL INJECTOR ELECTRICAL SIGNAL CHECK (TYPES 1, 2, 3, 4)		
• Check the electrical continuity of the injector harness between each injector and the ECA as follows: • Disconnect the injector lead and insert the continuity checker No. FA-407 (from the Rotunda Fuel Injector Tester/Cleaner) into the injector lead plug. • Start the engine. • Observe whether the continuity checker blinks (showing a completed circuit for the injector being tested). • Repeat the check for each injector. • **Do all injector circuit leads show continuity?**	Yes ▶ No ▶	GO to EFD47 . CHECK for 12 volts at each injector lead. REPAIR or replace leads as required. REFER to Quick Test, Section 14 of this manual.
EFD47 FUEL INJECTOR FLOW AND LEAKAGE CHECK (TYPES 1, 2, 3, 4) EFI ONLY		
• Observe the Warning-Instructions to avoid fuel spillage and injury. • Using the Fuel Injector Tester Cleaner as described in Section 4 of this manual, and accompanying instruction, clean, test, and reclean as required, the fuel injectors, and verify that the flow rate for the injector group is within specification, using the color range on the Tester flow meter corresponding to the injector top color. • Verify the injector color for the engine by the Injector Application chart, Section 4 of this manual. • With the Tester/Cleaner still installed on the fuel system note any significant pressure loss due to injector leakage when the tester pump is turned off. • Check the fuel injectors individually for leakage as required using the Injector Bench Fixture and the Fuel Injector Bench Testing Procedure associated with the Rotunda Tester/Cleaner as required and verify that each injector leakage rate is within specification (1 drop/min. maximum). • **Is the flow rate for the injector group and the leakage rate for individual injectors within specification?**	Yes ▶ No ▶	GO to Section 2. REPLACE the faulty injectors as required. RERUN test EFD47 .

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Electric Fuel Delivery System
Fuel Pressure Regulator — CFI

EFD

Fuel Pressure Regulator Description

The pressure regulator is integral to the fuel charging main body and is located near the rear of the air horn. It is located so as to nullify the effects of supply line pressure drops. Its design is such that it is not sensitive to back pressure in the return line to the tank.

One function of the pressure regulator is to maintain fuel supply pressure upon engine and fuel pump shutdown. The regulator functions as a downstream check valve and traps the fuel between itself and the fuel pump. The maintenance of fuel pressure upon engine shutdown precludes fuel line vapor formation and allows for rapid restarts and for stable idle operation immediately thereafter.

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD48 CHECK FUEL PRESSURE		
o Disconnect electrical connection to inertia switch. o Crank engine for five seconds to reduce fuel pressure in the fuel charging system. o Install fuel pressure gauge. o Reconnect electrical connection to inertia switch. o Start and run engine. o Stabilize fuel pressure. o Turn engine off. o **Does fuel pressure drop?**	Yes ▶ No ▶	GO to EFD49 . GO to EFD31 . Also REFER to Group 24 of the Car Shop Manual.
EFD49 CHECK VACUUM BLEED DOWN		
o Remove fuel inlet and outlet lines at fuel charging assembly. o Connect hand held vacuum pump to the fuel charging assembly fuel inlet side. o Apply 15-20 in-Hg vacuum. o Vacuum should not drop more than 10 in-Hg in 10 seconds. o **Is vacuum drop greater than 10 in-Hg in 10 seconds?**	Yes ▶ No ▶	GO to EFD50 . Injector/O-Ring regulator seat/valve system OK. GO to EFD31 .
EFD50 CHECK VACUUM BLEED DOWN		
o Refer to Test Step EFD49 . o Cap/plug the fuel outlet line. o Repeat Test Step EFD49 . o **Is vacuum drop greater than 10 in-Hg in 10 seconds?**	Yes ▶ No ▶	GO to EFD51 . SERVICE fuel pressure regulator. REFER to Group 24 of the Car Shop Manual.

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Electric Fuel Delivery System
Fuel Pressure Regulator — CFI

EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD51 CHECK INJECTOR		
• With the injector in the fuel charging assembly: • Plug the injector tip outlet with finger. • Repeat Test Step EFD49 . • **Is vacuum drop greater than 10 in-Hg in 10 seconds?**	Yes ▶	REPLACE the injector O-Rings – 2. REPEAT Test Step EFD51 .
	No ▶	REPLACE injector. REFER to Group 24 of the Car Shop Manual.

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SECTION 12

6.1L/7.0L Heavy Duty Truck— Check Engine Light

Contents

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Application, Description and Operation

VEHICLE APPLICATION

NOTE: This applies to only 1989 49 State 6.1L and 7.0L heavy duty trucks (gasoline engines only). All other vehicle applications with "CHECK ENGINE" light concerns, go to Quick Test, Section 14.

DESCRIPTION AND OPERATION

The Check Engine Light (CEL) System on the 6.1L and 7.0L heavy duty trucks consists of an instrument panel mounted amber lens (with the words "CHECK ENGINE" printed on it) that is electrically connected to an Emission Maintenance Warning (EMW) module located under the instrument panel. The purpose of the system is to alert the customer that 60,000 mile emission system maintenance is required on the vehicle. Specific emission system maintenance requirements are shown in the vehicle Owner Guide (Medium and Heavy Duty Truck).

The EMW module actually measures accumulated vehicle ignition Key On time and is designed to continuously close an electrical circuit to the amber lens after 2000 hours of vehicle operation. Assuming an average vehicle speed of 30 mph, the 2000 hours equates to 60,000 miles of vehicle operation. Actual vehicle mileage intervals will vary considerably as individual driving habits vary.

Note that when the ignition key is initially placed in the ON position, the EMW/CEL system microprocessor will activate the amber lens for 2 to 5 seconds to indicate proper function of the system. When approximately 60,000 miles of vehicle operation is reached, the EMW/CEL light will remain on continuously, indicating that emission system maintenance is required. After the vehicle's emission system maintenance has been performed, the technician should reset the sensor for another 60,000 mile period.

When To Use This Diagnostic Procedure

Emission maintenance should be performed if the "CHECK ENGINE" light is on continuously and either of the following is true:

- Mileage is between 45,000 and 75,000 miles with no previous emission maintenance.
- Mileage is greater than 105,000 miles.

Use this procedure only when the specified mileage does not apply or if the EMW module cannot be reset after emission maintenance is completed.

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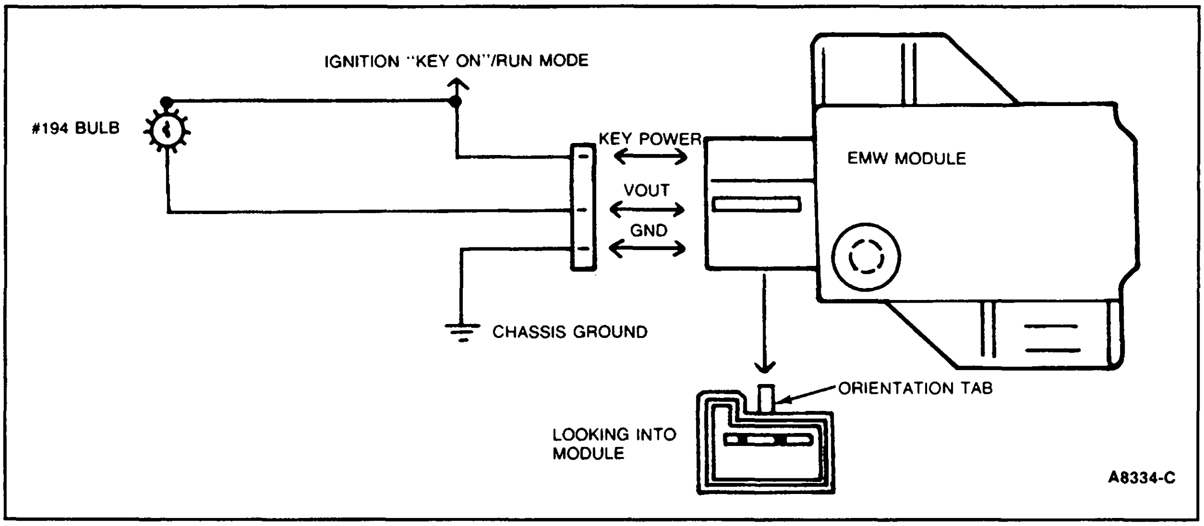
6.1L/7.0L Heavy Duty Truck Check Engine Light (CEL)

SYSTEM SCHEMATIC

6.1L and 7.0L Heavy Duty Trucks



NOTE: All other engine/vehicle applications with "CHECK ENGINE" light concerns, go to Quick Test, Section 14.

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6.1L/7.0L Heavy Duty Truck — Check Engine Light (CEL)

Pinpoint Test | **CE**

NOTE: This applies to only 1989 49 State 6.1L and 7.0L heavy duty trucks (gasoline engines only). All other vehicle applications with "CHECK ENGINE" light concerns, go to Quick Test, Section 14.

TEST STEP	RESULT ▶	ACTION TO TAKE
CE1 VERIFY CHECK ENGINE LIGHT STATUS		
• Key off. • Turn key to ON position. • **Does CEL come on for 2-5 seconds and go off?**	Yes ▶ No ▶	System OK. GO to CE2 .
CE2 CHECK MODULE POWER		
• EMW connected. • Key on. • DVOM, Rotunda 007-00001 or equivalent, on 20 volt scale. • Measure voltage between keypower and ground circuits at the EMW module. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to CE3 . SERVICE open in keypower or ground circuit.
CE3 CHECK MODULE OUTPUT		
• Key Off. • DVOM on 20 volt scale. • EMW connected. • Turn key On. • Measure voltage between keypower and vout circuits at the EMW module. • **Is voltage greater than 10.5 volts for 2-5 seconds and then drops to less than 4.0 volts?**	Yes ▶ No ▶	GO to CE4 . GO to CE5 .

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6.1L/7.0L Heavy Duty Truck — Check Engine Light (CEL)

Pinpoint Test CE

TEST STEP	RESULT ▶	ACTION TO TAKE
CE4 CHECK CONTINUITY OF KEYPOWER AND VOUT CIRCUITS		
• Key off. • Disconnect EMW module. • DVOM 200 ohm scale. • Measure resistance between keypower terminal and CEL bulb. • Measure resistance between vout terminal and CEL bulb. • **Is resistance of both circuits less than 5 ohms?**	Yes ▶	REPLACE bulb. RECONNECT EMW module. REPEAT CE1.
	No ▶	SERVICE open circuit. RECONNECT EMW module and REPEAT CE1.
CE5 CHECK VOUT FOR SHORTS TO GROUND OR POWER		
• Key off. • Disconnect EMW module. • Disconnect CEL bulb. • DVOM on 200,000 ohm scale. • Measure resistance between vout and battery negative terminal and between vout and battery positive. • **Is resistance greater than 10,000 ohms in both checks?**	Yes ▶	RECONNECT EMW module. RECONNECT CEL bulb. If light is always on in CE1, GO to Table 2. If light is always off in CE1, GO to Table 1.
	No ▶	SERVICE short circuit. Reconnect EMW module. Reconnect CEL bulb. REPEAT CE1.

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6.1L/7.0L Heavy Duty Truck — Check Engine Light (CEL) Check Engine Light Never On

Table 1

NOTE: This applies to only 1989 49 state 6.1L and 7.0L heavy duty trucks (gasoline engines only). All other vehicle applications with "CHECK ENGINE" light concerns, go to Quick Test, Section 14.

SITUATION	ACTION TO TAKE
0 to 15,000 Miles	REPLACE EMW module with 2000 hour "time out" module. No emission maintenance required.
15,000 to 45,000 Miles	REPLACE EMW module with pretimed 1000 hour module. No emission maintenance required.
45,000 to 75,000 Miles (no previous emission maintenance was done).	REPLACE EMW module with 2000 hour "time out" module. Perform required emission maintenance.
60,000 to 75,000 Miles (previous emission maintenance has been done).	REPLACE EMW module with 2000 hour "time out" module. No emission maintenance required.
75,000 to 105,000 Miles	Replace EMW module with pretimed 1000 hour module. No emission maintenance required.
Greater than 105,000 Miles	REPLACE EMW module with 2000 hour "time out" module. Perform required emission maintenance.

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6.1L/7.0L Heavy Duty Truck — Check Engine Light (CEL) Check Engine Light Always On

Table 2

NOTE: This applies to only 1989 49 state 6.1L and 7.0L heavy duty trucks (gasoline engines only). All other vehicle applications with "CHECK ENGINE" light concerns, go to Quick Test, Section 14.

SITUATION	ACTION TO TAKE
0 to 15,000 Miles	RESET EMW module*. No emission maintenance required.
15,000 to 45,000 Miles	RELACE EMW module with pretimed 1000 hour module. No emission maitenance required.
45,000 to 75,000 Miles (no previous emission maintenance was done).	RESET EMW module*. Perform emission maintenance.
60,000 to 75,000 miles (previous emission maintenance has been done).	RESET EMW module*. No emission maintenance required.
75,000 to 105,000 Miles	REPLACE EMW module with pretimed 1000 hour module. No emission maintenance required.
Greater than 105,000 Miles	RESET EMW module*. Perform emission maintenance.

***Refer to Table 3 for reset procedure. If not a resetable type module, replace with 2000 hour "time out" EMW module. If any module cannot be reset as described in Table 3, replace with a 2000 "time out" EMW module.**

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6.1L/7.0L Heavy Duty Truck — Check Engine Light (CEL) Reset Procedure

Table 3

RESET PROCEDURE FOR EMW MODULE

The timer may be reset either before or after the timeout period has been exceeded. The procedure is the same for either condition.

Step 1

Turn the ignition switch to the OFF position.

Step 2

Lightly push the shank end of a No. 2 or 7/32 inch drill bit through the .2 inch diameter hole with the sticker labeled 'RESET' and lightly press down and hold. Go to Step 3.

Step 3

Still pressing the drill bit down, turn the ignition switch to the RUN position. The CEL lamp will then light and should remain lighted for as long as the drill bit is pressed down. Hold the drill bit down for approximately five seconds. Go to Step 4.

Step 4

Remove the drill bit. The lamp should go out within approximately 2 to 5 seconds indicating a reset has occurred. (If the lamp does not go out then begin again with Step 1). Turn the ignition switch to the OFF position and go to Step 5.

Step 5

Turn the ignition switch to the RUN position. The CEL lamp will light for approximately 2 to 5 seconds and will then go out. This verifies that a proper reset of the module has been accomplished. If the lamp remains on, then the proper reset has not occurred and the reset procedure should be repeated. Turn the ignition switch to the OFF position.

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SECTION 13

Ignition Systems, Timing Procedures and Diagnostics

Contents

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Ignition System Applications

PASSENGER CAR ENGINES	IGNITION SYSTEM
1.9/2.3/2.5/5.0L	TFI-IV
3.0L — 49 States	TFI-IV
3.0L — California	TFI-IV with Computer Controlled Dwell (CCD)
*3.0L SHO	Distributorless
*3.8L SC	Distributorless
3.8L	TFI-IV Closed Bowl Distributor
5.8L	Duraspark II

TRUCK ENGINES	IGNITION SYSTEM
*2.3L	Distributorless
2.9/3.0/4.9/5.0/5.8L	TFI-IV
7.0L	Duraspark II
7.5L	TFI-IV Closed Bowl Distributor

*Refer to the separate Distributorless Ignition Section for these applications.

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Initial Timing Set Procedure

PRELIMINARY NOTE

The procedure described below for setting initial timing is to be used under normal circumstances. If problems are encountered setting initial timing using this procedure, the spark timing procedure that follows should be used to diagnose the problem.

Procedure	Non-EEC	EEC-IV
① Place transmission in PARK or NEUTRAL, A/C and heater in OFF position.	X	X
② Remove vacuum hoses from the distributor vacuum advance connection at the distributor and plug the hoses.	X	
③ Connect an inductive timing light, Rotunda 059-00006 or equivalent.	X	X
④ Connect a tachometer, Rotunda 059-00010 or equivalent.	X	
⑤ Disconnect the single wire in-line spout connector or remove the shorting bar from the double wire spout connector.		X
⑥ If the vehicle is equipped with a barometric pressure switch (-12A243-) disconnect it from the ignition module and place a jumper wire across the pins at the ignition module connector (yellow and black wires).	X	
⑦ Start the engine and allow it to warm up to operating temperature.	X	X
⑧ With engine at timing rpm if specified, check/adjust initial timing to specification.	X	X
⑨ Reconnect single wire in-line spout connector or reinstall the shorting bar on the double wire spout connector. Check timing advance to verify distributor is advancing beyond the initial setting. If it is not, refer to Section 14 Quick Test 04.		X
⑩ Remove test instruments.	X	X
⑪ Unplug and reconnect vacuum hoses.	X	
⑫ Remove jumper from ignition connector and reconnect if applicable.	X	

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SPARK TIMING ADVANCE

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Spark Timing Advance
EEC-IV Equipped Vehicles

CHECKOUT

- Visually inspect the engine compartment to ensure all vacuum hoses and spark plug wires are properly routed and securely connected.
- Examine all wiring harnesses and connectors for insulation damage, burned, overheated, loose or broken conditions.
- Be certain battery is fully charged.
- All accessories should be off during diagnosis.

EQUIPMENT

Obtain the following test equipment or an equivalent:

- Small straight pin.
- Volt/Ohm Meter Rotunda 014-00407.

NOTES

- This procedure is applicable to all EEC-IV equipped vehicles.
- Spark Timing Advance is controlled by the EEC system. This procedure checks the capability of the ignition module to receive the spark timing command from the EEC module.

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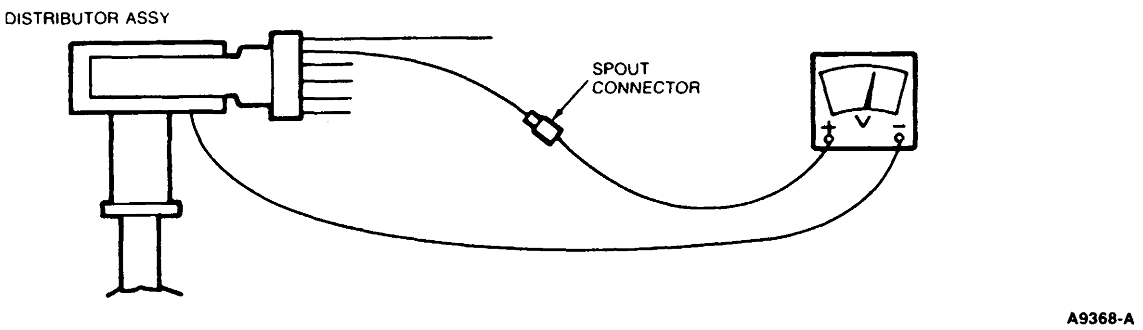
Spark Timing Advance — EEC

Test 1

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Key in OFF position. 2. Disconnect the pin in-line connector near the TFI module (SPOUT). 3. Attach the negative (−) VOM lead to the distributor base. 4. Start the engine and measure the battery voltage at idle. 5. Measure the voltage on the TFI module side of the pin in-line connector. 6. **Is the result between 30 percent and 60 percent of battery voltage?**	Yes ▶ No ▶	TFI is OK. GO to EEC Diagnostics, Section 14 Computed Timing. GO to Test 2.



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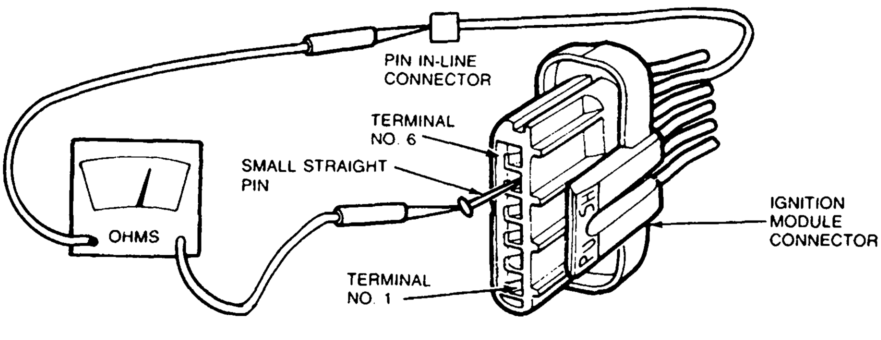
Spark Timing Advance — EEC

Test 2

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Separate wiring harness connector from ignition module. Inspect for dirt, corrosion and damage. **NOTE: PUSH connector tabs to separate.** 2. Using small straight pin inserted into connector terminal 5, measure resistance between the terminal and the TFI module side of the pin in-line connector. 3. **Is the result less than 5 ohms?**	Yes ▶ No ▶	REPLACE the TFI module. SERVICE the wiring between the pin in-line connector and the TFI connector.



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Spark Timing Advance
Non-EEC Equipped Vehicles

CHECKOUT

- Visually inspect the engine compartment to ensure all vacuum hoses and spark plug wires are properly routed and securely connected.
- Examine all wiring harnesses and connectors for insulation damage, burned, overheated, loose or broken conditions.
- Be certain battery is fully charged.
- All accessories should be off during diagnosis.

EQUIPMENT

Obtain the following test equipment or an equivalent:

- Inductive Timing Light, Rotunda 059-00006.
- Tachometer, Rotunda 099-00003.
- Vacuum Gauge, Rotunda 059-00008.

NOTES

- This procedure is not applicable to EEC-IV equipped vehicles.
- This procedure checks the operation of the centrifugal and vacuum advance mechanisms in the distributor. It is also to be used to check the operation of the retard feature of the (-12A244-) Ignition Module.

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Spark Timing Advance — Non-EEC

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 1		
o Disconnect and plug distributor vacuum hose(s). o Connect timing light and tachometer.	▶	GO to Step 2.
STEP 2		
If Ignition Module (-12A244-) is used: o Disconnect two wire connector (YELLOW and BLACK wires). o Jumper pins in module connector. o If (-12A244-) Ignition Module not used, skip this Step.	▶	GO to Step 3.
STEP 3		
o Start and warm-up engine. o Check that engine speed is at or below timing rpm.* o **Is engine speed at or below timing rpm*?**	Yes ▶	OK. GO to Step 4.
	No ▶	RESET rpm below timing rpm. GO to Step 4.

* Refer to Vehicle Emission Control Information Decal.

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Spark Timing Advance — Non-EEC

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 4		
• **Positive-Buy timing?**	Yes ▶	GO to Step 5.
	No ▶	GO to Step 6.
STEP 5		
• Check initial timing. **NOTE: Record reading for later use.** • **Is timing within ± 4 degrees of required?***	Yes ▶	GO to Step 7.
	No ▶	RESET timing. REMOVE or deface positive buy label. GO to Step 7.
STEP 6		
• Check initial timing. **NOTE: Record reading for later use.** • **Is timing within ± 2 degrees of required?***	Yes ▶	GO to Step 7.
	No ▶	RESET timing. GO to Step 7.

* Refer to Vehicle Emission Control Information Decal.

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Spark Timing Advance — Non-EEC

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 7		
• **Basic Part No. (-12A244-) on ignition module?**	Yes ▶	REMOVE jumper in two wire connector. RECONNECT two wire connector. GO to Step 8.
	No ▶	GO to Step 11.
STEP 8		
• Check initial timing at timing rpm. • **Is timing the same as Step 5 or 6?**	Yes ▶	DISCONNECT two wire connector (YELLOW and BLACK wires) at ignition module. GO to Step 9. **NOTE: Engine may die when connector is separated due to excessive spark retard. If this happens spark retard operation is OK. RECONNECT two wire connector, GO to Step 11.**
	No ▶	REFER to the MCU Diagnosis Manual then return to Step 2.
STEP 9		
◦ Check initial timing at timing rpm. ◦ **Is timing retarded from Step 8?**	Yes ▶	Retard operation OK. REMOVE vacuum gauge and RECONNECT vacuum hose (if used). GO to Step 11.
	No ▶	GO to Step 10.

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Spark Timing Advance — Non-EEC

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 10		
• Substitute new ignition module. • Connect two wire (RED and WHITE wires) and four wire connectors. • Jumper pins in two wire (YELLOW and BLACK wires) connector. • Check initial timing at timing rpm. • **Is timing the same as Step 5 or 6?**	Yes ▶	RETURN to Step 8. **NOTE: If ignition module substitution appears to correct problem, RECONNECT original module and REPEAT this Step to verify service.**
	No ▶	REPEAT Step 10.
STEP 11		
• Increase engine speed to 2,500 rpm. • Check spark timing. • Return to idle rpm. **NOTE: Refer to the Service Performance Manual for total advance at 2,500 rpm/vacuum advance disconnected under the correct engine calibration for specification.** • **Is timing within specification?**	Yes ▶	GO to Step 12.
	No ▶	REPLACE distributor. REPEAT this Step.
STEP 12		
• Check initial timing at timing rpm. • **Is timing the same as Step 5 or 6?**	Yes ▶	Distributor mechanical advance mechanism OK. GO to Step 13.
	No ▶	REPLACE distributor. RETURN to Step 11.

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Spark Timing Advance — Non-EEC

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 13		
• Install distributor vacuum **advance** hose without spark delay valve if used. • Increase engine speed to 2,500 rpm, hold for 60 seconds. • Check spark timing. • Return to idle rpm. **NOTE: Refer to the Service Performance Manual for total advance at 2,500 rpm/vacuum advance connected under the correct engine calibration for specification.** • **Is timing within specification?**	Yes ▶ No ▶	Distributor vacuum advance mechanism OK. REFER to Section 3. CHECK operation of spark-delay valve if used. GO to Step 17. GO to Step 14.
STEP 14		
• Install vacuum gauge in vacuum advance hose, using tee connector. • Increase engine speed to 2,500 rpm, hold for 60 seconds. • Check for presence of vacuum. • Return to idle rpm. • **Was a minimum of 51 kPa (15 in-Hg) vacuum obtained?**	Yes ▶ No ▶	INSPECT diaphragm for vacuum leaks and stator assembly for sticking/binding. SERVICE/REPLACE as necessary. RETURN to Step 13. GO to Step 15.
STEP 15		
• Check engine for vacuum lockout devices. (Refer to Vehicle Emission Control Information Decal) • **Does engine have lockout devices?**	Yes ▶ No ▶	GO to Step 16. SERVICE vacuum source. RETURN to Step 13.

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Spark Timing Advance — Non-EEC

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 16		
• Disconnect and plug distributor vacuum advance hose. • Attach vacuum hose between distributor vacuum advance diaphragm connection and manifold vacuum. • Increase engine speed to 2,500 rpm. • Check spark timing. • Return to idle rpm. **NOTE: Refer to the Service Performance Manual for total advance at 2,500 rpm/vacuum advance connected under the correct engine calibration for specification.** • **Is timing within specification?**	Yes ▶	SERVICE vacuum source. DISCONNECT manifold vacuum. REMOVE vacuum gauge and tee. RETURN to Step 13.
	No ▶	INSPECT diaphragm for leaks and stator assembly for sticking/ binding. SERVICE/REPLACE as necessary. DISCONNECT manifold vacuum. RECONNECT normal vacuum source. RETURN to Step 13.
STEP 17		
• **Does distributor have dual diaphragm?**	Yes ▶	GO to Step 18.
	No ▶	Spark timing systems OK.

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Spark Timing Advance — Non-EEC

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 18		
• Disconnect and plug vacuum hose to vacuum advance connection on diaphragm. • Connect vacuum hose to retard connection on diaphragm. • Check spark timing at idle rpm. • **Is timing retarded from Step 5 or 6?**	Yes ▶	Spark timing systems OK. RECONNECT vacuum hose to vacuum advance connection.
	No ▶	GO to Step 19.
STEP 19		
• Install vacuum gauge in vacuum hose to retard connection on diaphragm. • Check for presence of vacuum at idle rpm. • **Is a minimum of 15 kPa (15 in-Hg) vacuum obtained?**	Yes ▶	REPLACE distributor diaphragm assembly. RETURN to Step 18.
	No ▶	SERVICE vacuum source. RETURN to Step 18.

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Diagnostic Procedures

PRELIMINARY NOTES

The engine analyzer is used to diagnose problems in the secondary side of the ignition system. This is covered in Part 1, which is common for all 1989 ignition systems (except distributorless ignition).

For problems in the primary side of the ignition system, there is a separate Part 2 for each of the three basic types of ignition systems.

The beginning point for Ignition System Diagnosis is the Symptom Index. This will direct you to the proper part for your engine symptom.

If after completing a Part 1 or Part 2 diagnosis and a problem has not been solved, the problem is either an intermittent one or is not in the ignition system. If you suspect it to be intermittent, refer to intermittent diagnosis. Otherwise return to the Diagnostic Routines, (Section 2), for additional assistance.

SYMPTOM INDEX

ENGINE SYMPTOM	START AT
• CRANKS NORMALLY BUT WON'T START	PART 2
• STARTS NORMALLY BUT WON'T RUN (STALLS)	PART 2
• CRANKS NORMALLY BUT SLOW TO START	PART 1
• ROUGH IDLE	PART 1
• ENGINE MISS	PART 1
• POOR FUEL ECONOMY	PART 1

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PART 1

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Preliminary Checkout & Equipment

CHECKOUT

- Visually inspect the engine compartment to ensure all vacuum hoses and spark plug wires are properly routed and securely connected.
- Examine all wiring harnesses and connectors for insulation damage, burned, overheated, loose or broken conditions.
- Be certain the battery is fully charged.
- All accessories should be off during diagnosis.

EQUIPMENT

Obtain the following test equipment or an equivalent:

- Spark Tester, Special Service Tool D81P-6666-A. See **NOTE.**
- Engine Analyzer, Rotunda 002-00373.
- Volt/Ohm Meter, Rotunda 014-00407.

NOTE

- A spark plug with a broken side electrode **is not** sufficient to check for spark and may lead to incorrect results.

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Ignition Coil Secondary Voltage | Part 1 | Test 1

TEST STEP	RESULT ▶	ACTION TO TAKE
• **Will engine start and run?**	Yes ▶	Test Result OK. GO to Part 1, Test 2.
	No ▶	INSPECT ignition coil for damage, carbon tracking. MEASURE resistance of ignition coil wire. REPLACE if greater than 7,000 ohms per foot. GO to Part 2, Test 1.

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Secondary Display | Part 1 | Test 2

NOTE: If this portion of the diagnostic procedure is to provide accurate results, it is essential that the calibration of your engine analyzer be maintained. Refer to your equipment manual. If this is not available, an estimate of the calibration can be made by connecting the spark tester (D81P-6666-A or equivalent) to a properly operating ignition system and measuring the firing voltage of the spark tester only. Do not include the firing voltage of the rotor-to-cap gap. The spark tester firing voltage should be approximately 28 KV.

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Connect engine analyzer to view **parade** display of ignition system secondary. 2. While **slowly** increasing engine rpm from idle to 2,000 rpm, compare engine analyzer display to the following illustrations. The illustrations shown are four cylinder but are typical for all engines. 3. Disconnect engine analyzer.		

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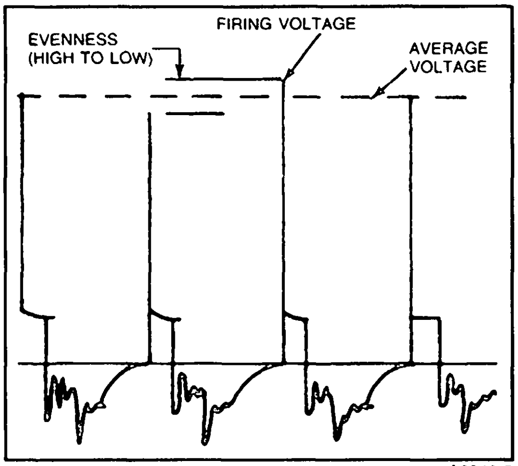
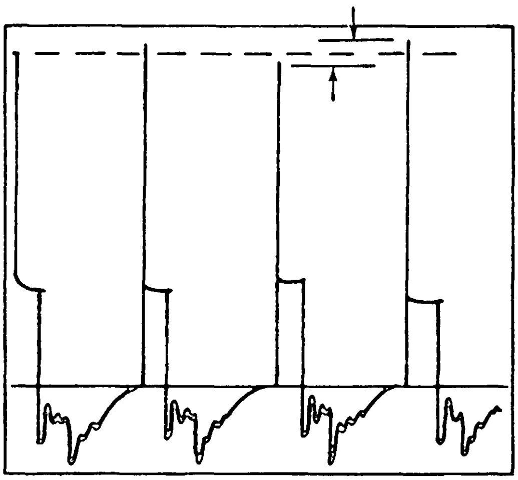
Secondary Display — Continued | Part 1 | Test 2

TEST STEP	RESULT ▶	ACTION TO TAKE
	The average value of spark plug firing voltage: 15 KV or less with evenness of spark plug firing voltage: 5 KV or less ▶	These are normal values for a properly operating ignition system.
	The average value of spark plug firing voltage: greater than 15 KV with evenness of spark plug firing voltage: 5 KV or less ▶	**Problems affecting all cylinders:** CHECK ignition coil wire for proper installation in coil and distributor cap. MEASURE resistance of ignition coil wire. REPLACE if greater than 7,000 ohms per foot. Wide spark plug gaps — all cylinders, (usually from worn electrodes due to high mileage). INSPECT cap and rotor for problems causing excessive cap-to-rotor gap.

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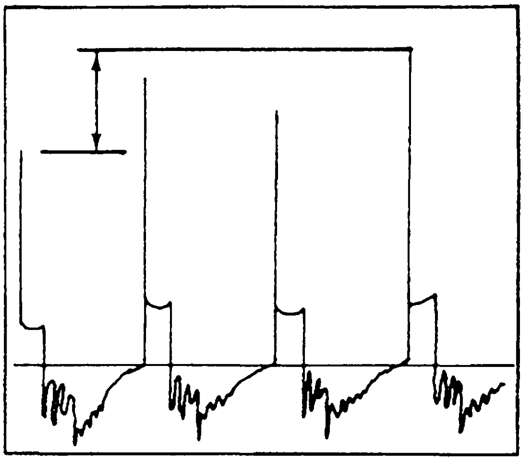
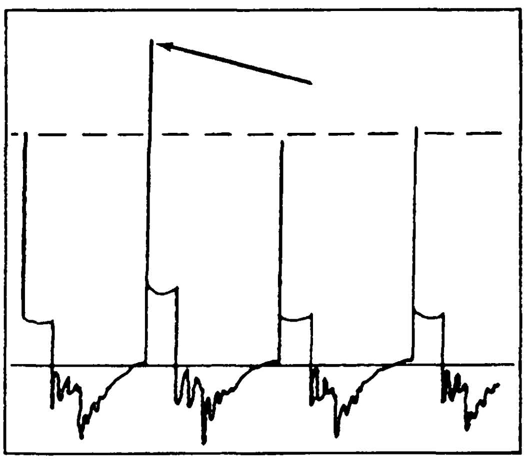
Secondary Display — Continued | Part 1 | Test 2

TEST STEP	RESULT	ACTION TO TAKE
 A6344-B	Evenness of spark plug firing voltage: greater than 5 KV ▶	**Problems affecting some cylinders:** Wide spark plug gap(s) or worn electrode(s). Improperly installed cap, adapter, or rotor.
 A6345-B	Consistently high spark plug firing voltage in one or more cylinders ▶	Spark plug wire(s) not firmly connected to distributor cap or spark plug. Disconnected spark plug wire(s). Wide spark plug gap(s). Open plug wire(s). GO to Part 1, Test 3.

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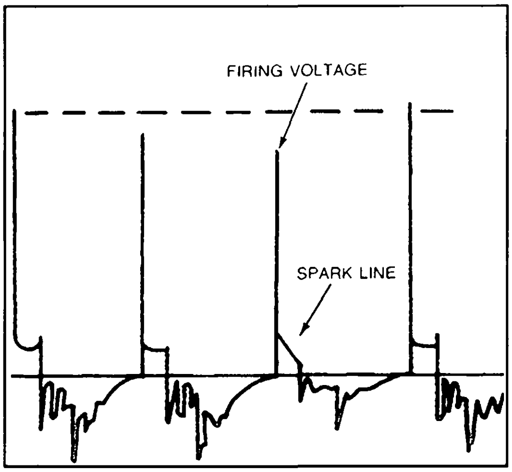
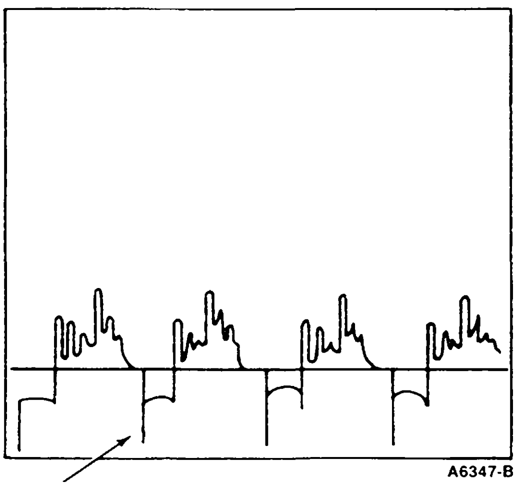
Secondary Display — Continued | Part 1 | Test 2

TEST STEP	RESULT	ACTION TO TAKE
 A6346-B	Consistently low spark plug firing voltage or sloping spark line in one or more cylinders ▶	Fouled spark plug(s). Narrow spark plug gap(s). Spark plug wire(s) grounding on engine. Inspect for damage. Carbon tracking in cap and adapter.
 A6347-B	Spark plug firing voltage negative going ▶	Ignition coil primary circuit reversed. CHECK wiring harness for ignition coil primary circuit. If OK, REPLACE ignition coil.

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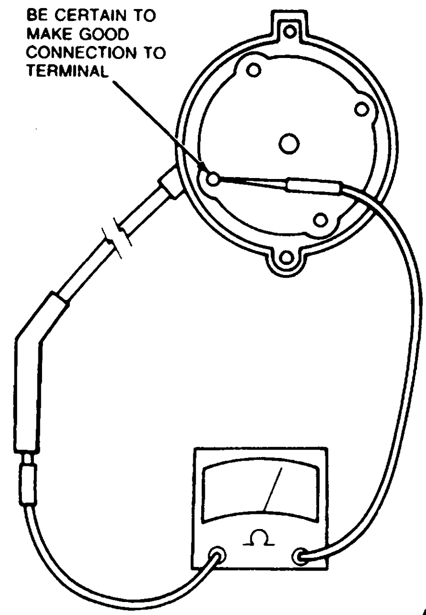
Spark Plug Wire Resistance | Part 1 | Test 3

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Remove distributor cap from distributor. 2. Check for spark plug wires firmly seated on cap. 3. Disconnect spark plug end of suspect wire(s). 4. Measure resistance from terminal in cap to spark plug terminal. 5. Reinstall distributor cap and connect spark plug wire to spark plug. CAUTION **Do not, under any circumstances, puncture a spark plug wire when measuring resistance. Measure only as instructed.** 6. **Was resistance less than 7,000 ohms per foot?**	Yes ▶	Spark plug wire resistance OK.
	No ▶	REPLACE spark plug wire(s).



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PART 2
DURASPARK II
IGNITION SYSTEM

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Preliminary Checkout, Equipment & Notes

CHECKOUT

- Visually inspect the engine compartment to ensure all vacuum hoses and spark plug wires are properly routed and securely connected.
- Examine all wiring harnesses and connectors for insulation damage, burned, overheated, loose or broken conditions.
- Be certain the battery is fully charged.
- All accessories should be off during diagnosis.

EQUIPMENT

Obtain the following test equipment or an equivalent:

- Spark Tester, Special Service Tool D81P-6666-A. See **NOTE.**
- Volt/Ohm Meter Rotunda 014-00407.
- 12 Volt Test Lamp.
- Small straight pins (2).

NOTES

- A spark plug with a broken side electrode **is not** sufficient to check for spark and may lead to incorrect results.
- All wire colors referred to in this part relate to the colors of the ignition module wires. When working with a wiring harness, the wires must be traced back to the ignition module for proper color identification.
- When instructed to inspect a wiring harness, both a visual inspection and a continuity test should be performed.
- When making measurements on a wiring harness or connector, it is good practice to wiggle the wires while measuring.

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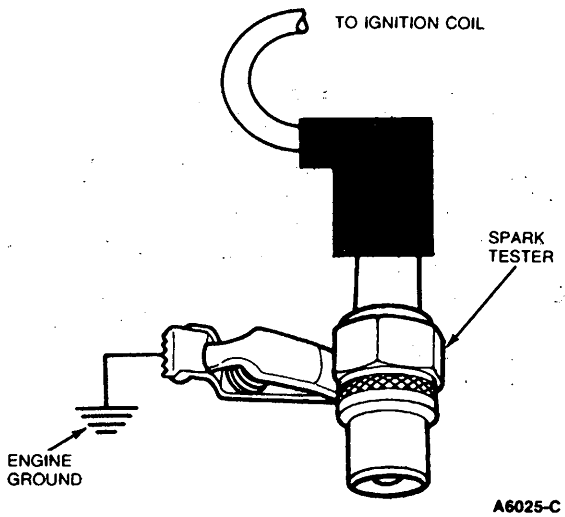
Start Circuits	DS II	Part 2 Test 1

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Connect spark tester between ignition coil wire and engine ground. 2. Crank engine using ignition switch. 3. **Were sparks present?** 	Yes ▶	GO to Part 2, Test 2.
	No ▶	MEASURE resistance of ignition coil wire. REPLACE if greater than 7,000 ohms per foot. INSPECT ignition coil for damage, carbon tracking. CRANK engine to verify distributor rotation. REFER to Shop Manual, Group 23 (Group 3 for Compact Truck) and SERVICE as required. GO to Part 2, Test 5.

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Run Circuits | DS II | Part 2 Test 2

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Turn ignition switch from OFF to RUN to OFF position several times. 2. Spark should occur each time switch goes from RUN to OFF position. 3. Remove spark tester, reconnect coil wire to distributor cap. 4. **Were sparks present?**	Yes ▶	INSPECT distributor cap, adapter, rotor for cracks, carbon tracking. CHECK for roll pin securing armature to sleeve in distributor. CHECK that ORANGE and PURPLE wires not crossed between distributor and ignition module. If ignition module has Basic Part No. (-12A244-), GO to Spark Timing Advance to check spark retard operation.
	No ▶	GO to Part 2, Test 3.

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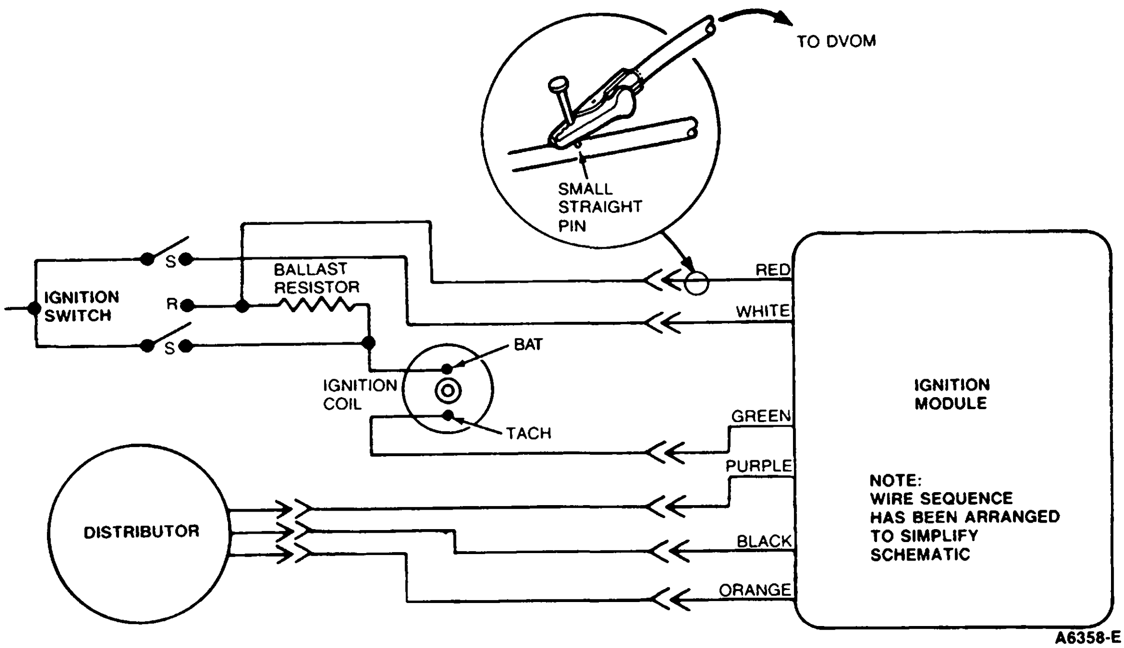
Module Voltage | DS II | Part 2 Test 3

TEST STEP	RESULT ▶	ACTION TO TAKE
• Turn ignition switch off. 1. Carefully insert small straight pin in RED module wire. CAUTION **Do not allow straight pin to contact electrical ground.** 2. Attach negative (–) VOM lead to distributor base. 3. Measure battery voltage. 4. Measure voltage at straight pin with ignition switch in RUN position. 5. Turn ignition switch to OFF position. 6. Remove straight pin. 7. **Is voltage 90 percent of battery voltage or greater?**	Yes ▶	GO to Part 2, Test 4.
	No ▶	REFER to vehicle wiring diagram. INSPECT wiring harness between module and ignition switch. Damaged or worn ignition switch. REFER to Shop Manual, Group 31 (Group 14 for Compact Truck).



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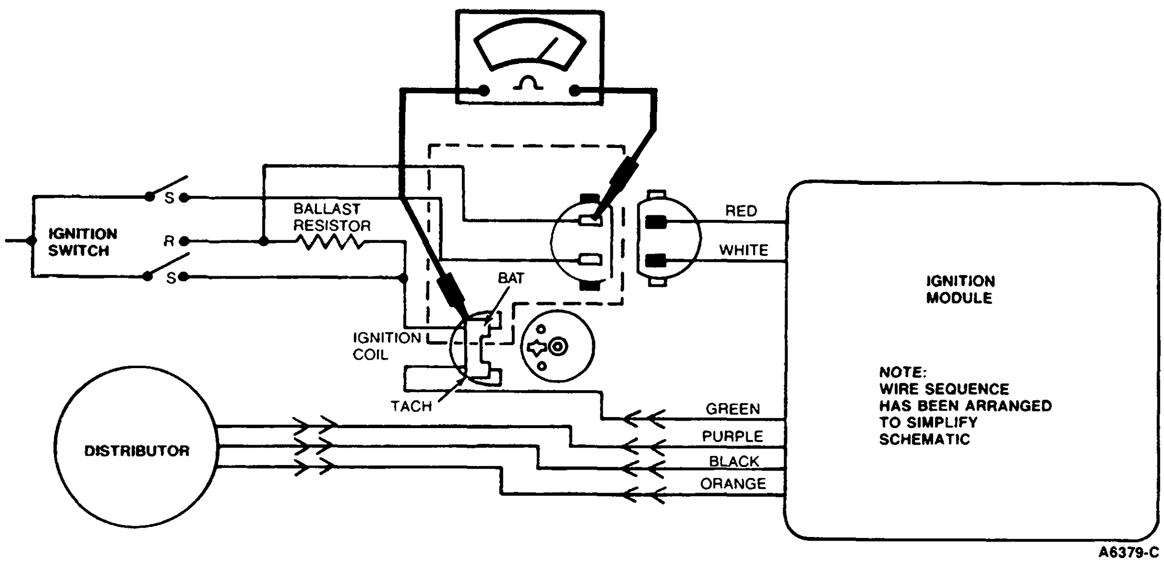
Ballast Resistor	DS II	Part 2 Test 4

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Separate and inspect ignition module two wire connector with RED and WHITE wires. 2. Disconnect and inspect ignition coil connector. 3. Measure ballast resistor between BAT terminal of ignition coil connector and wiring harness connector mating with RED module wire. 4. Reconnect all connectors. 5. **Was the resistance 0.8 to 1.6 ohms?**	Yes ▶ No ▶	REPLACE ignition module. REPLACE ballast resistor.



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Supply Voltage Circuits

DS II

Part 2 Test 5

<table>
<tr><th>TEST STEP</th><th>RESULT ▶</th><th>ACTION TO TAKE</th></tr>
<tr><td>
1. Remove SPARK TESTER, reconnect coil wire to distributor cap.
2. If starter relay has I terminal, disconnect cable from starter relay to starter motor.
3. If starter relay does not have I terminal, disconnect wire to S terminal of starter relay.
4. Carefully insert small straight pins in RED and WHITE module wires.
CAUTION
Do not allow straight pins to contact electrical ground.
5. Measure battery voltage.
6. Following table below, measure voltage at points listed with ignition switch in position shown.
NOTE: Attach negative (−) VOM lead to distributor base. Wiggle wires in wiring harness when measuring.
<table>
<tr><th>Wire/ Terminal</th><th>Circuit</th><th>Ignition Switch Test Position</th></tr>
<tr><td>Red</td><td>Run</td><td>Run</td></tr>
<tr><td>White</td><td>Start</td><td>Start</td></tr>
<tr><td>'Bat' Terminal Ignition Coil</td><td>Ballast Resistor Bypass</td><td>Start</td></tr>
</table>
7. Turn ignition switch to OFF position.
8. Remove straight pins.
9. Reconnect any cables/wires removed from starter relay.
10. Is voltage 90 percent of battery voltage or greater?
</td><td>Yes ▶

No ▶</td><td>Test result OK.

GO to Part 2, Test 6.

REFER to vehicle wiring diagram. INSPECT wiring harness and connector(s) in faulty circuit(s).

Damaged or worn ignition switch. REFER to Shop Manual, Group 31 (Group 14 for Compact Truck).

Radio interference capacitor on ignition coil.</td></tr>
</table>

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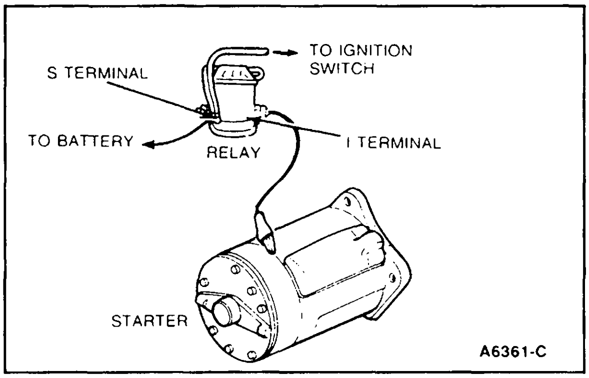
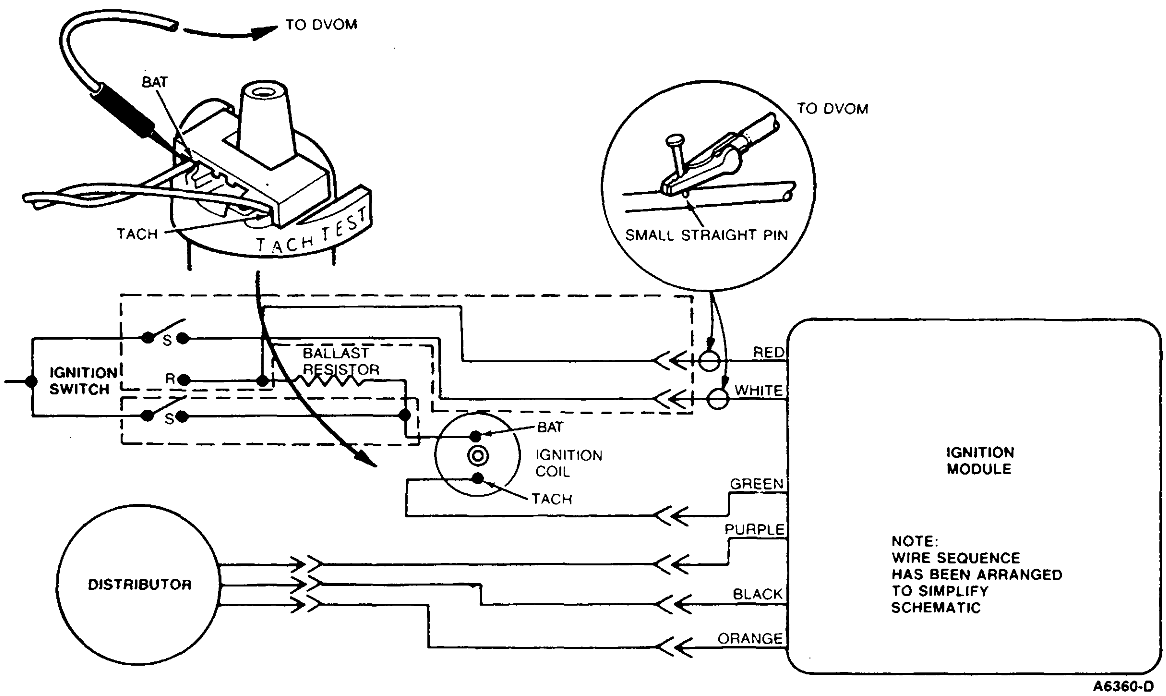
Supply Voltage Circuits — Continued

DS II

Part 2 Test 5





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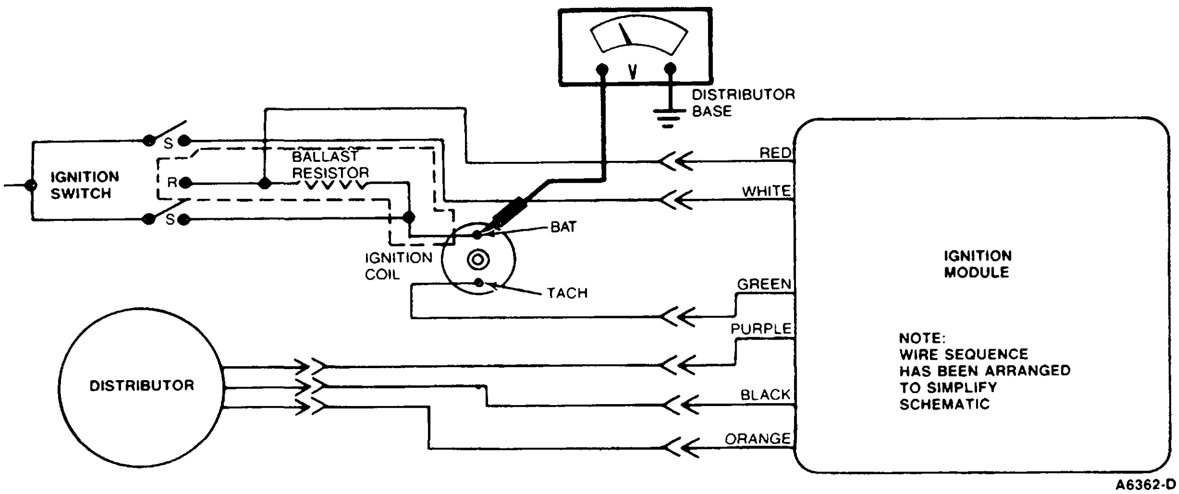
Ignition Coil Supply Voltage

DS II

Part 2 Test 6

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Attach negative (–) lead of VOM to distributor base. 2. Turn ignition switch to RUN position. 3. Measure voltage at BAT terminal of ignition coil. 4. Turn ignition switch to OFF position. 5. **Was the voltage 6 to 8 volts?**	Yes ▶ No ▶	GO to Part 2, Test 7. GO to Part 2, Test 12.



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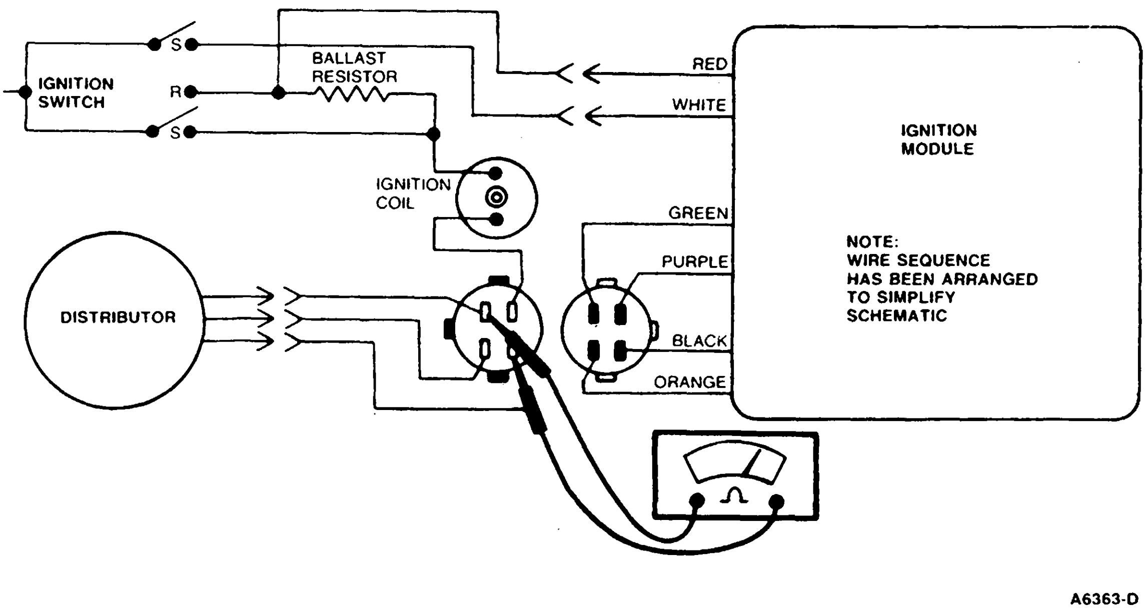
Distributor Stator Assembly and Wiring Harness

DS II

Part 2 Test 7

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Separate ignition module four wire connector. Inspect for dirt, corrosion, and damage. 2. Measure stator assembly and wiring harness resistance between wiring harness terminals mating with ORANGE and PURPLE module wires. **NOTE: Wiggle wires in wiring harness when measuring.** 3. **Was the resistance 400 to 1,300 ohms?**	Yes ▶	Test result OK. GO to Part 2, Test 8.
	No ▶	GO to Part 2, Test 11.



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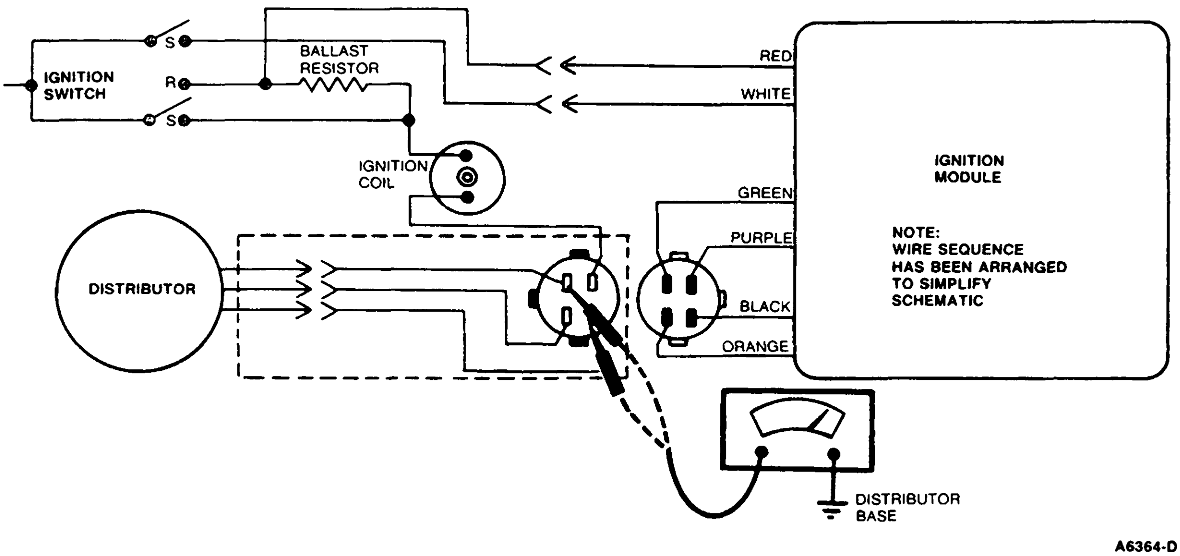
Ignition Module to Distributor Stator Assembly Wiring Harness

DS II

Part 2 Test 8

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Attach one VOM lead to distributor base. 2. Alternately measure resistance between wiring harness terminals mating with ORANGE and PURPLE module wires and ground. 3. Reconnect four wire connector. 4. **Was the resistance greater than 70,000 ohms?**	Yes ▶	TEST result OK. GO to Part 2, Test 9.
	No ▶	INSPECT wiring harness between module connector and distributor, including distributor grommet.



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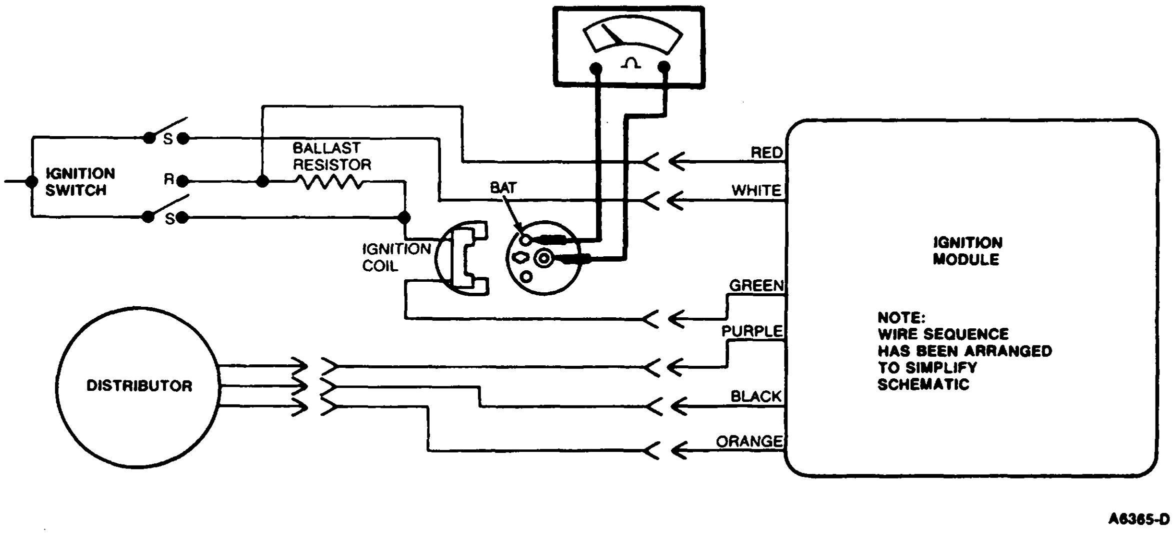
Ignition Coil Secondary Resistance

DS II

Part 2 Test 9

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Disconnect and inspect ignition coil connector and coil wire. 2. Measure secondary resistance from BAT terminal to high voltage terminal. 3. Reconnect ignition coil wire. 4. **Was the resistance 7,700 to 10,500 ohms?**	Yes ▶ No ▶	Test result OK. GO to Part 2, Test 10. REPLACE ignition coil.



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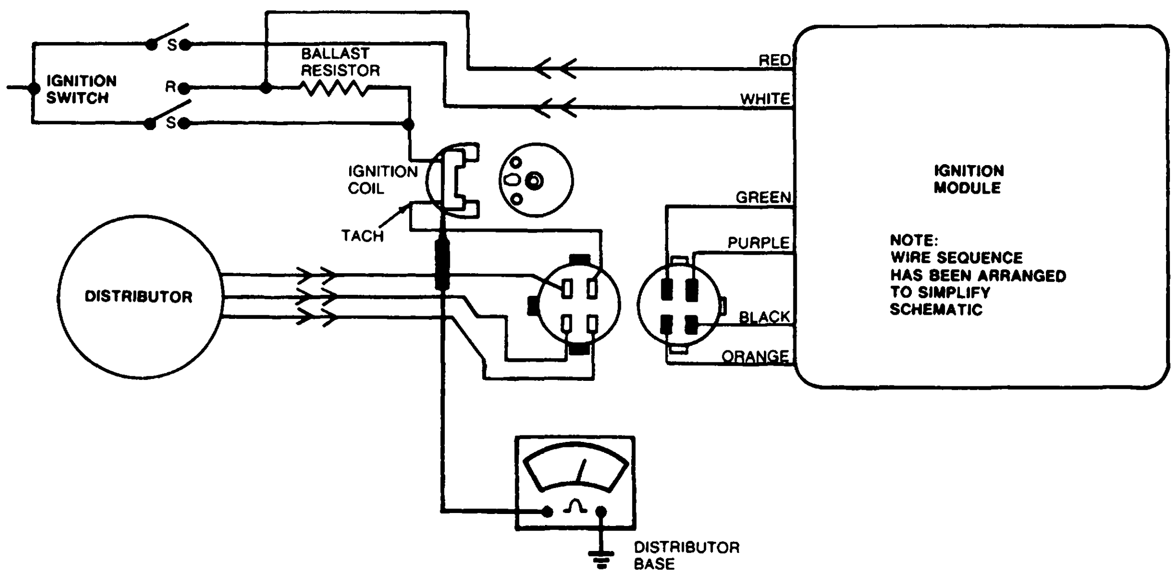
Module to Coil Wire

DS II

Part 2 Test 10

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Separate and inspect ignition module four wire connector and ignition coil connector from coil. 2. Connect one lead of VOM to distributor base. 3. Measure resistance between TACH terminal of ignition coil connector and ground. 4. Reconnect ignition module and coil connectors. 5. **Was the resistance greater than 100 ohms?**	Yes ▶ No ▶	REPLACE ignition module. INSPECT wiring harness between ignition module and coil.



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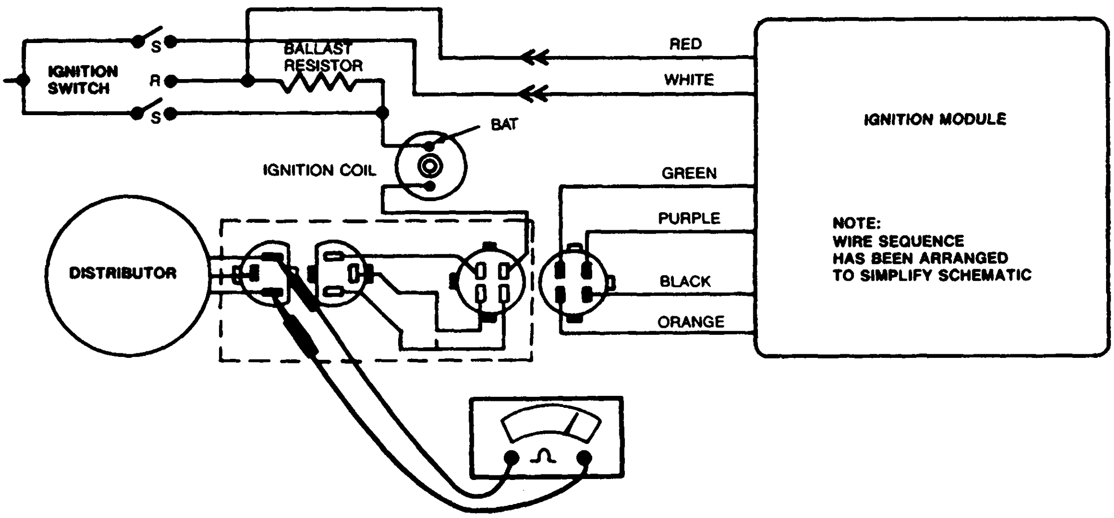
Distributor Stator Assembly | DS II | Part 2 Test 11

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Separate distributor connector from harness. Inspect for dirt, corrosion, and damage. 2. Measure stator assembly resistance across ORANGE and PURPLE wires at distributor connector. 3. Reconnect distributor and module connectors. 4. **Was resistance 400 to 1,300 ohms?**	Yes ▶	Test result OK. INSPECT wiring harness between distributor and ignition module.
	No ▶	REPLACE stator assembly.



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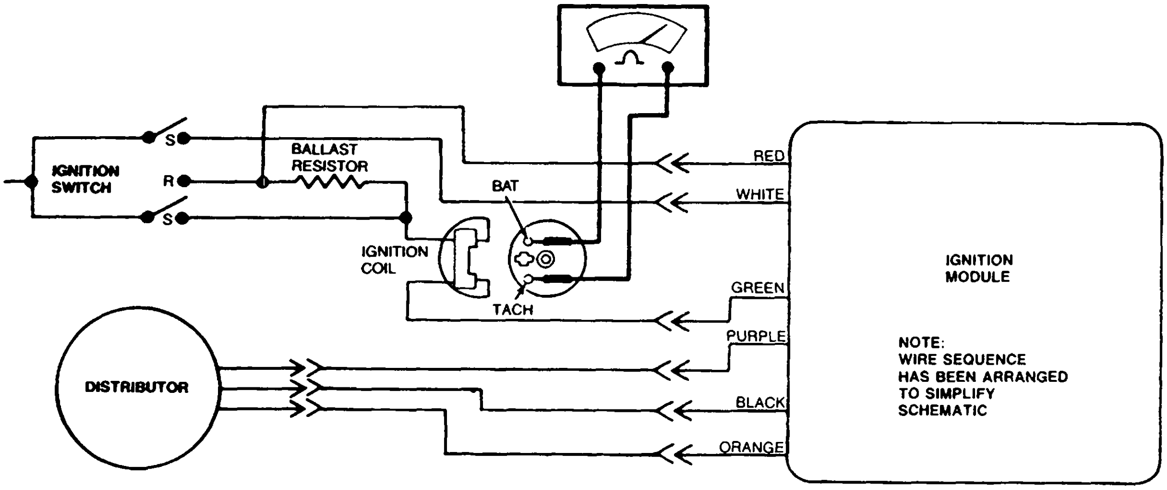
Ignition Coil Primary Resistance	DS II	Part 2 Test 12

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Disconnect ignition coil connector. 2. Measure primary resistance from BAT to TACH terminal. 3. Reconnect ignition coil connector. 4. **Was resistance 0.8 to 1.6 ohms?**	Yes ▶ No ▶	Test result OK. GO to Part 2, Test 13. REPLACE ignition coil.



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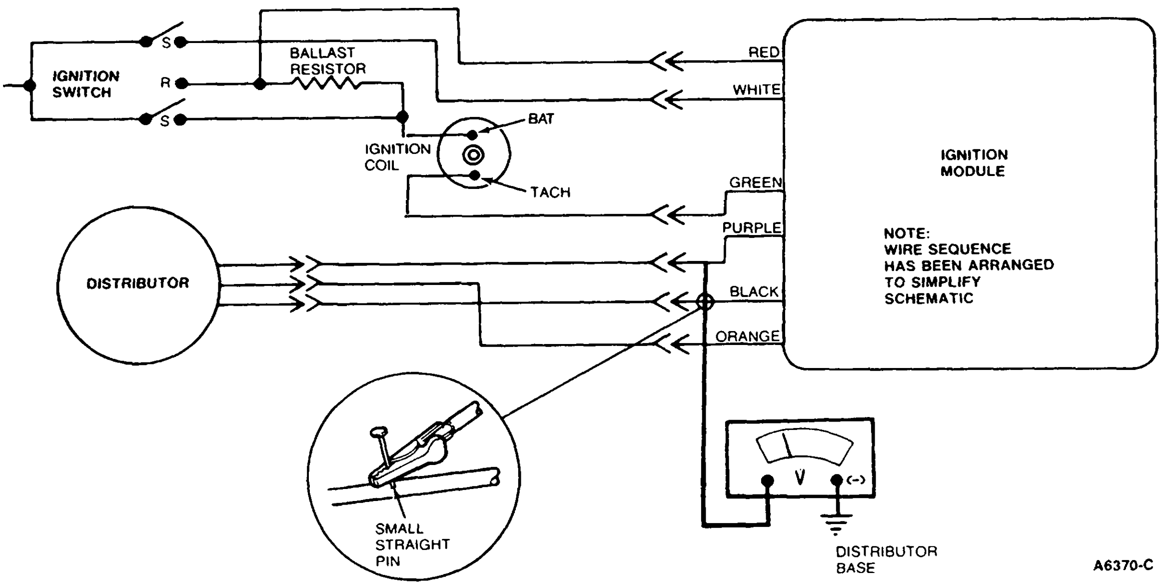
Primary Circuit Continuity

DS II

Part 2 Test 13

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Carefully insert small straight pin in module GREEN wire. CAUTION **Do not allow straight pin to contact electrical ground.** 2. Attach negative (−) VOM lead to distributor base. 3. Turn ignition switch to RUN position. 4. Measure voltage at GREEN module wire. 5. Turn ignition switch to OFF position. 6. Remove straight pin. 7. **Was voltage greater than 1.5 volts?**	Yes ▶ No ▶	GO to Part 2, Test 14. INSPECT wiring harness and connectors between ignition module and coil.



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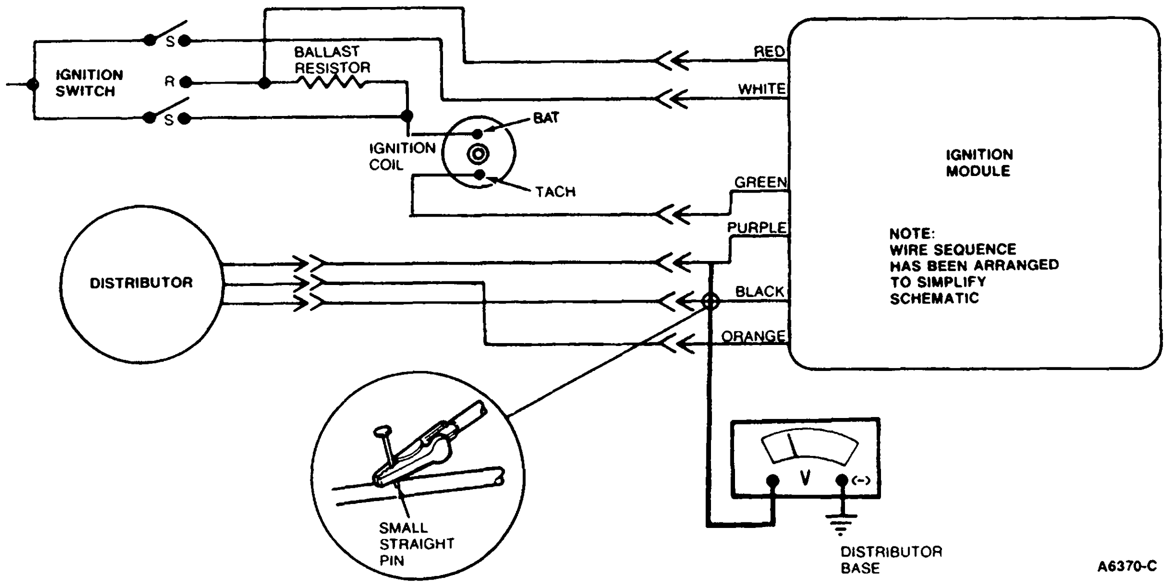
Ground Circuit Continuity

DS II

Part 2 Test 14

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Carefully insert small straight pin in module BLACK wire. CAUTION **Do not allow straight pin to contact electrical ground.** 2. Attach negative (−) VOM lead to distributor base. 3. Turn ignition switch to RUN position. 4. Measure voltage at BLACK wire. 5. Turn ignition switch to OFF position. 6. Remove straight pin. 7. **Was voltage greater than 0.5 volts?**	Yes ▶ No ▶	GO to Part 2, Test 15. REPLACE ignition module.



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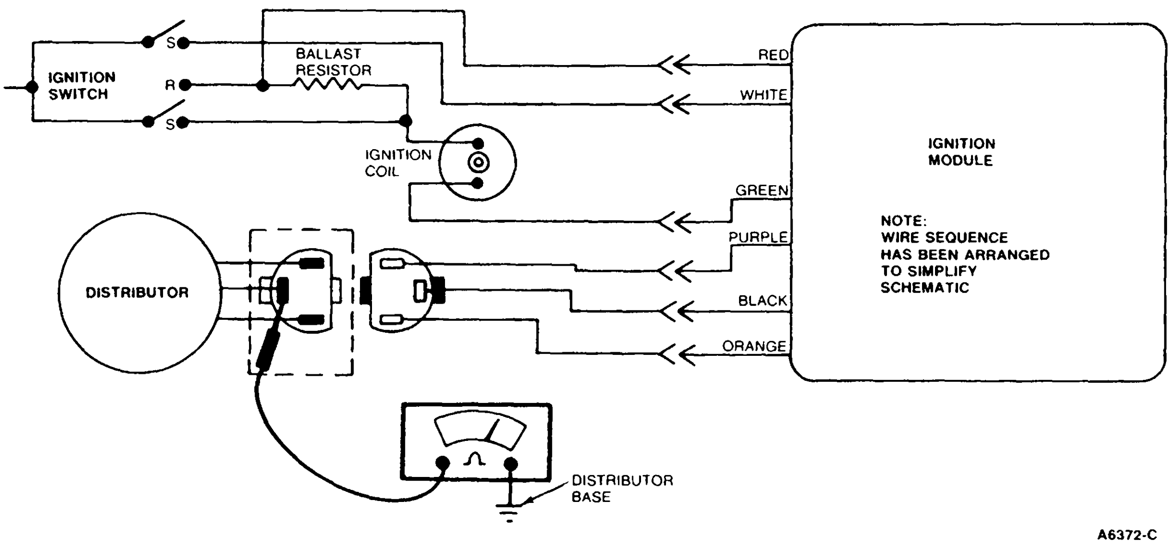
Distributor Ground Circuit Continuity

DS II

Part 2 Test 15

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Separate distributor connector from harness. Inspect for dirt, corrosion, and damage. 2. Attach one lead of VOM to distributor base. 3. Measure resistance by attaching other VOM lead to BLACK wire in distributor connector. **NOTE: Wiggle distributor grommet when measuring.** 4. Reconnect distributor connector. 5. **Was resistance less than 1 ohm?**	Yes ▶	Test result OK. INSPECT wiring harness and connectors between distributor and ignition module.
	No ▶	INSPECT ground screw in distributor.



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PART 2
TFI-IV
IGNITION SYSTEM
AND
TFI WITH COMPUTER CONTROLLED DWELL
(CCD)

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Preliminary Checkout, Equipment & Notes

CHECKOUT

- Visually inspect the engine compartment to ensure all vacuum hoses and spark plug wires are properly routed and securely connected.
- Examine all wiring harnesses and connectors for insulation damage, and burned, overheated, loose or broken conditions.
- Check that the TFI module is securely fastened to the distributor base.
- Be certain the battery is fully charged.
- All accessories should be off during diagnosis.

EQUIPMENT

Obtain the following test equipment or an equivalent:

- Spark Tester, Special Service Tool D81P-6666-A. See **NOTES.**
- Volt/Ohm Meter Rotunda 014-00407.
- 12 Volt Test Light.
- Small straight pin.
- Remote Starter Switch.
- TFI Ignition Tester, Rotunda 105-00002.
- E-core Ignition Coil E73F-12029-AB.
- Ignition coil secondary wire E43E-12A012-AB.

NOTES

- A spark plug with a broken side electrode **is not** sufficient to check for spark and may lead to incorrect results.
- When instructed to inspect a wiring harness, both a visual inspection and a continuity test should be performed.
- When making measurements on a wiring harness or connector, it is good practice to wiggle the wires while measuring.
- References to pin-in-line connector apply to a shorting bar type connector used to set base timing.
- This procedure is intended to identify faulty components or wiring while the fault is present. If the complaint is of an intermittent condition, refer to Intermittent Diagnosis.

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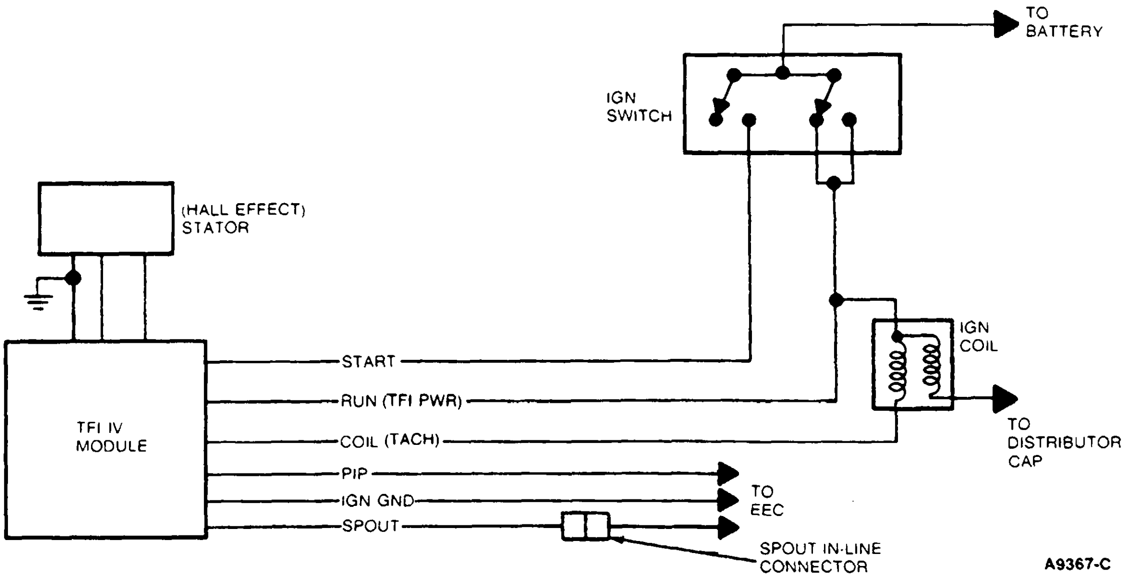
Functional Schematic

TFI-IV And TFI-IV With CCD

The TFI-IV system electrical schematic is shown below. For detailed information, refer to the vehicle wiring diagram.



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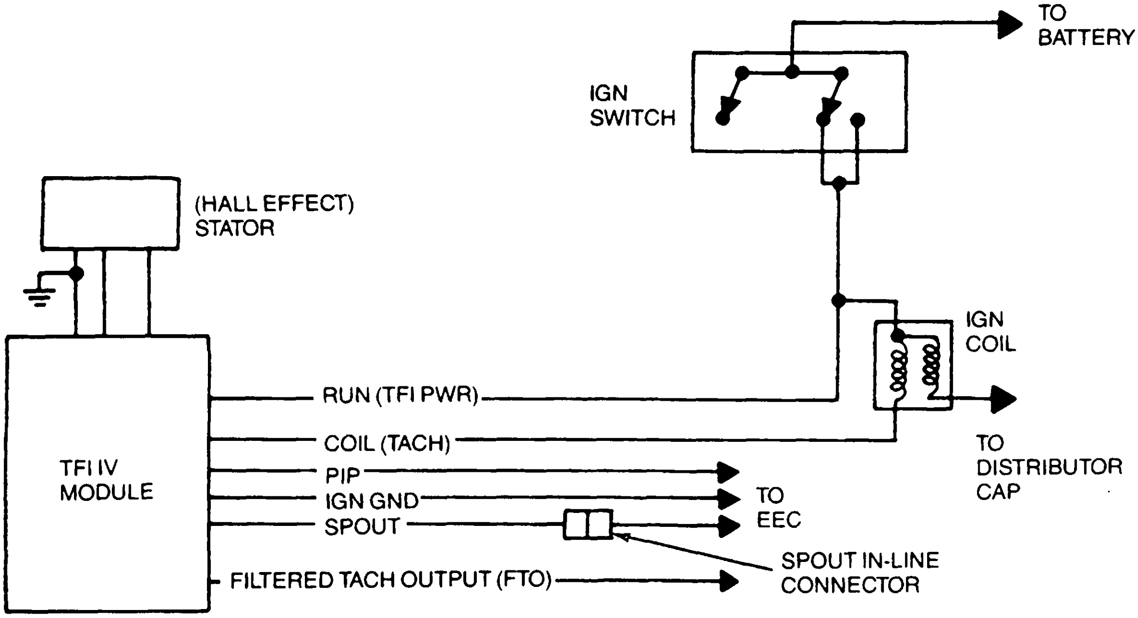
The TFI-IV with CCD system electrical schematic is shown below. For detailed information, refer to the vehicle wiring diagram.



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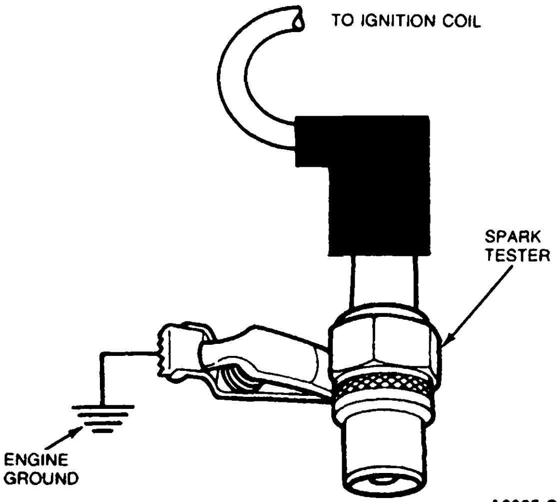
Ignition Coil Secondary Voltage (Crank Mode)

TFI-IV And TFI With CCD

Part 2 Test 1

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Connect spark tester between ignition coil wire and engine ground. 2. Crank engine. 3. Turn ignition switch to the OFF position. 4. **Was spark present?**  	Yes ▶	Test result OK. INSPECT distributor cap and rotor for damage/carbon tracking. If engine starts, GO to Part 1, Test 2, otherwise GO to Test 2.
	No ▶	INSPECT ignition coil for damage/carbon tracking. CRANK engine to verify distributor rotation. Refer to Shop Manual, Group 23 (Group 3 for Compact Truck) and SERVICE as required. GO to Test 4.

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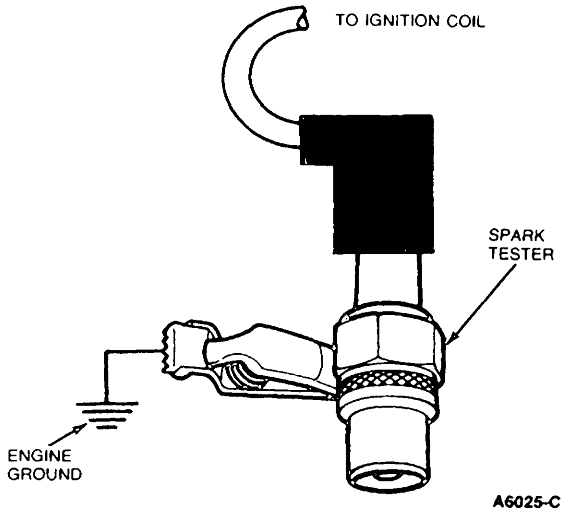
Ignition Coil Secondary Voltage (Run Mode)	TFI-IV And TFI With CCD	Part 2 Test 2

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Place the transmission shift lever in the PARK (A/T) or NEUTRAL (M/T) position and set the parking brake. CAUTION **Failure to perform this step may result in the vehicle moving when the starter is subsequently engaged during the test.** 2. Disconnect wire at S terminal of starter relay. 3. Attach remote starter switch. 4. Turn ignition switch to the RUN position. 5. Crank the engine using remote starter switch. 6. Turn ignition switch to the OFF position. 7. Remove remote starter switch. 8. Reconnect wire to S terminal of starter relay. 9. **Was spark present?**	Yes ▶	Test result OK. Problem is not in the ignition system. RETURN to Diagnostic Routines, Section 2, to identify possible cause.
	No ▶	GO to Test 3.



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Wiring Harness

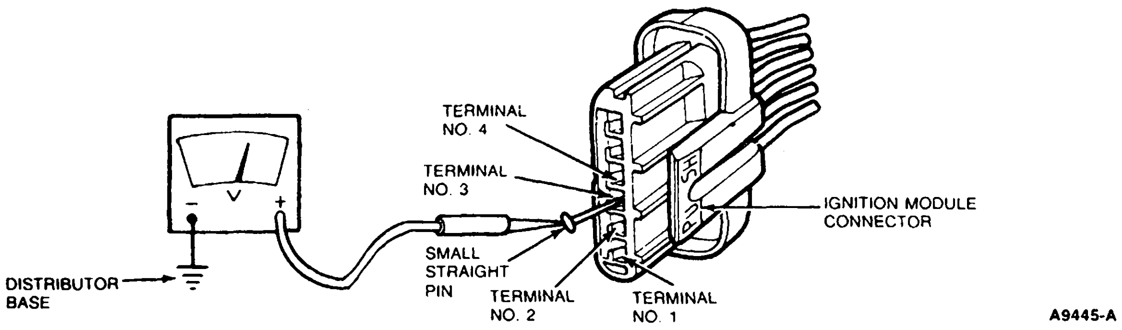
TFI-IV And TFI With CCD

Part 2 Test 3

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Separate wiring harness connector from ignition module. Inspect for dirt, corrosion, and damage. **NOTE: Push connector tabs to separate.** 2. Verify that the wire to the S terminal of starter relay is disconnected. 3. Attach negative (–) VOM lead to distributor base. 4. Measure battery voltage. 5. Following table below, measure connector terminal voltage by attaching VOM to small straight pin inserted into connector terminal and turning ignition switch to position shown. CAUTION **Do not allow straight pin to contact electrical ground.**	Yes ▶	REPLACE TFI module.
	No ▶	INSPECT for faults in wiring harness and connectors. REFER to vehicle wiring diagram for appropriate circuit. Damaged or worn ignition switch. REFER to Shop Manual, Group 31 (Group 14 for Compact Truck).

Connector Terminal	Wire/Circuit	Ignition Switch Test Position
#3	Run Circuit	Run and Start
#4	Start Circuit	Start

6. Turn ignition switch to OFF position.
7. Remove straight pin.
8. Reconnect wire to S terminal of starter relay.
9. **Was the value at least 90 percent of battery voltage in each case?**



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Stator — TFI	TFI-IV And TFI With CCD	Part 2 Test 4

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Place the transmission shift lever in the PARK (A/T) or NEUTRAL (M/T) position and set the parking brake. CAUTION **Failure to perform this step may result in the vehicle moving when the starter is subsequently engaged during the test.** 2. Disconnect the harness connector from the TFI module and connect the TFI tester. 3. Connect the red lead from the tester to the positive (+) side of the battery. 4. Disconnect the wire at the S terminal of the starter relay, and attach remote starter switch. 5. Crank the engine using the remote starter switch and note the status of the two LED lights. 6. Remove the tester and remote starter switch. 7. Reconnect the wire to the starter relay and the connector to the TFI. 8. **Did the PIP light blink?**	Yes ▶ No ▶	GO to Test 6. REMOVE distributor cap and VERIFY rotation. If OK, GO to Test 5.

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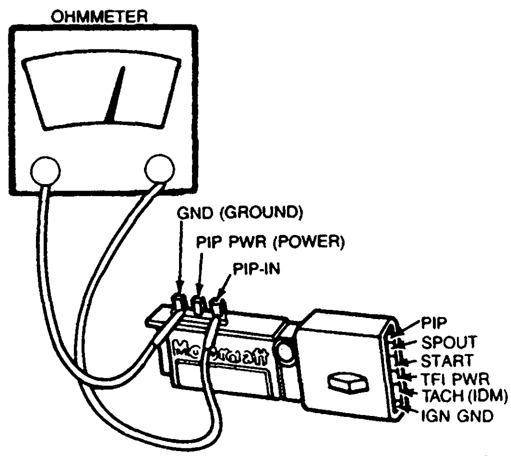
Stator — TFI-IV

TFI-IV And TFI With CCD

Part 2 Test 5

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Remove the distributor from the engine and the TFI module from the distributor.	Yes ▶	Replace stator.
2. Measure resistance between TFI module terminals as shown below.	No ▶	Replace TFI.
3. **Are all these readings as specified?**		

Measure Between These Terminals	Resistance Should Be
GND — PIP In	Greater than 500 Ohms
PIP PWR — PIP IN	Less than 2K Ohms
PIP PWR — TFI PWR	Less than 200 Ohms
GND — IGN GND	Less than 2 Ohms
PIP In — PIP	Less than 200 Ohms



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TFI Module	TFI-IV And TFI-IV With CCD	Part 2 Test 6

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Use status of Tach light from Test 4. 2. **Did the Tach light blink?**	Yes ▶	GO to Test 7.
	No ▶	REPLACE TFI module and CHECK for spark using the method described in Test 1. If spark was not present REPLACE the coil also.

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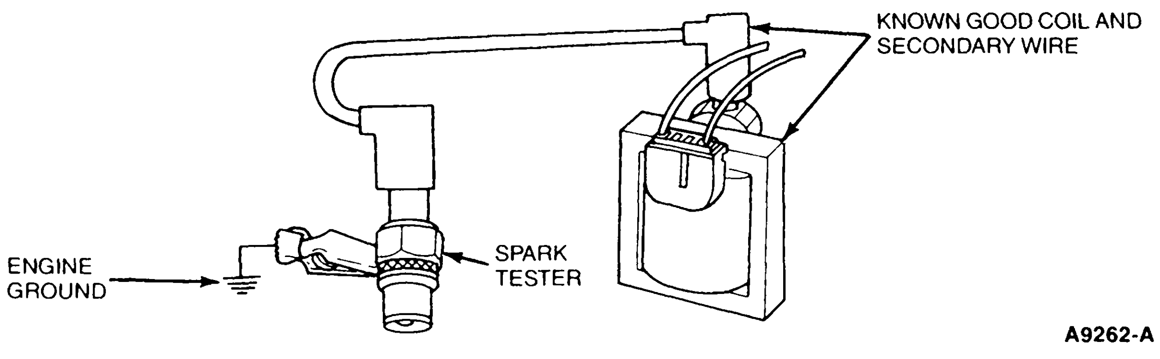
Ignition Coil and Secondary Wire	TFI-IV And TFI With CCD	Part 2 Test 7

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Disconnect ignition coil connector. Inspect for dirt, corrosion and damage. 2. Connect the ignition coil connector to a known good ignition coil. 3. Connect one end of a known good secondary wire to the spark tester. Connect the other end to the known good ignition coil. CAUTION **DO NOT HOLD THE COIL while performing this test. Dangerous voltages may be present on the metal laminations as well as the high voltage tower.** 4. Crank engine. 5. Turn ignition switch to OFF position. 6. **Was spark present?**	Yes ▶ No ▶	MEASURE resistance of the ignition coil wire (from vehicle). REPLACE if greater than 7,000 ohms per foot. If OK, REPLACE ignition coil. RECONNECT coil connector to the vehicle coil and spark tester to vehicle secondary wire and GO to Test 8.



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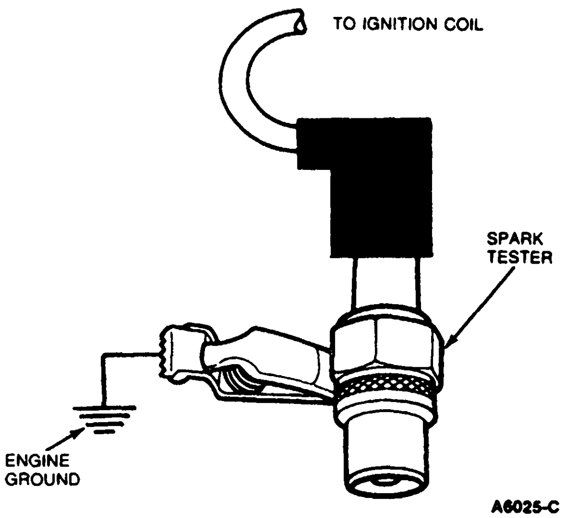
EEC-IV — TFI-IV	TFI-IV And TFI-IV With CCD	Part 2 Test 8

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Disconnect pin-in-line connector near the distributor. 2. Crank engine. 3. Turn ignition switch to OFF position. 4. **Was spark present?**	Yes ▶	CHECK PIP and Ignition ground wires for continuity. SERVICE as necessary. If OK GO to EEC-IV Diagnostics.
	No ▶	GO to Test 9.



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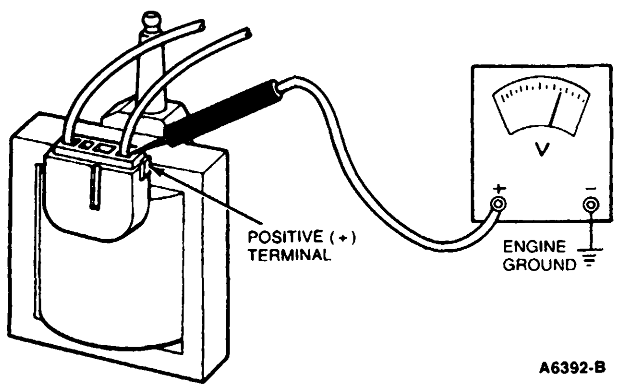
Ignition Coil Supply Voltage

TFI-IV And TFI-IV With CCD

Part 2 Test 9

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Attach negative (−) VOM lead to distributor base. 2. Measure battery voltage. 3. Turn ignition switch to RUN position. 4. Measure voltage at POSITIVE (+) terminal of ignition coil. 5. Turn ignition switch to OFF position. 6. **Was the value 90 percent of battery voltage or more?**	Yes ▶	GO to Test 10.
	No ▶	INSPECT and SERVICE wiring between ignition coil and ignition switch. REFER to vehicle wiring diagram. Worn or damaged ignition switch. REFER to Shop Manual, Group 31 (Group 14 for Compact Truck).



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Wiring Harness

TFI-IV

Part 2 Test 10

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Separate wiring harness connector from ignition module. Inspect for dirt, corrosion, and damage. **NOTE: Push connector tabs to separate.** 2. Disconnect the wire at S terminal of starter relay. 3. Attach negative (−) VOM lead to distributor base. 4. Measure battery voltage. 5. Following the appropriate table below, measure connector terminal voltage by attaching VOM to small straight pin inserted into connector terminal and turning ignition switch to position shown. CAUTION **Do not allow straight pin to contact electrical ground.**	Yes ▶	INSPECT for faults in wiring between the coil and TFI module terminal No. 2 or any additional wiring or components connected to that circuit. REFER to vehicle wiring diagram.
	No ▶	INSPECT for faults in wiring harness and connectors. REFER to vehicle wiring diagram for appropriate circuit. Damaged or worn ignition switch. REFER to Shop Manual, Group 31 (Group 14 for Compact Truck).

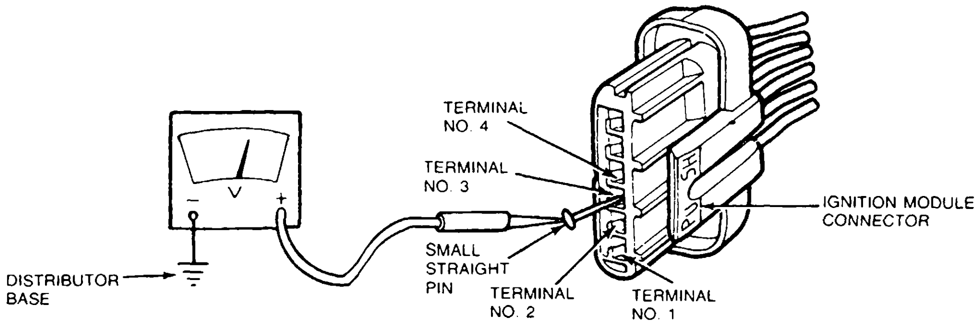
TFI Without CCD

Connector Terminal	Wire/Circuit	Ignition Switch Test Position
#3	Run Circuit	Run and Start
#4	Start Circuit	Start

TFI With CCD

Connector Terminal	Wire/Circuit	Ignition Switch Test Position
#3	Run Circuit	Run and Start

6. Turn ignition switch to OFF position.
7. Remove straight pin.
8. Reconnect wire to S terminal of starter relay.
9. **Was the value at least 90 percent of battery voltage in each case?**



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PART 2
TFI-IV
CLOSED BOWL
DISTRIBUTOR

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Preliminary Checkout, Equipment & Notes

CHECKOUT

- Visually inspect the engine compartment to ensure all vacuum hoses and spark plug wires are properly routed and securely connected.
- Examine all wiring harnesses and connectors for insulation damage, and burned, overheated, loose, or broken conditions.
- Be certain the battery is fully charged.
- All accessories should be off during diagnosis.

EQUIPMENT

Obtain the following test equipment or an equivalent:

- Spark Tester, Special Service Tool D81P-6666-A. See **NOTES.**
- Volt/Ohm Meter Rotunda 014-00407.
- 12 Volt Test Light.
- Small straight pin.
- Remote Starter Switch.
- TFI Ignition Tester, Rotunda 105-00003.
- E-Core Ignition Coil E73F-12029-AB.
- Ignition Coil Secondary Wire E43E-12A012-AB.

NOTES

- A spark plug with a broken side electrode **is not** sufficient to check for spark and may lead to incorrect results.
- When instructed to inspect a wiring harness, both a visual inspection and a continuity test should be performed.
- When making measurements on a wiring harness or connector, it is good practice to wiggle the wires while measuring.
- References to pin-in-line connector apply to shorting bar type connector used to set base timing.
- This procedure is intended to identify faulty components or wiring while the fault is present. If the complaint is of an intermittent condition refer to Intermittent Diagnosis.

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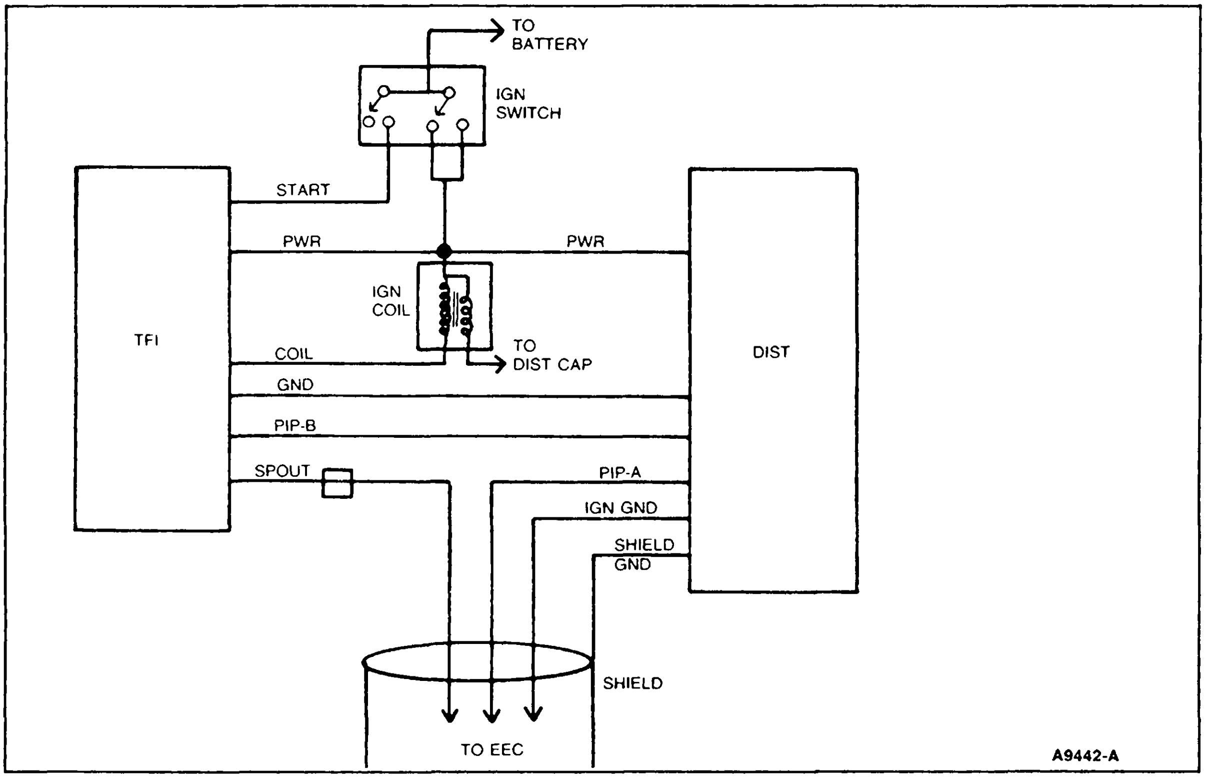
Functional Schematic

TFI-IV Closed Bowl Distributor

The TFI-IV Closed Bowl Distributor system electrical schematic is shown below. For detailed information, refer to the vehicle wiring diagram.



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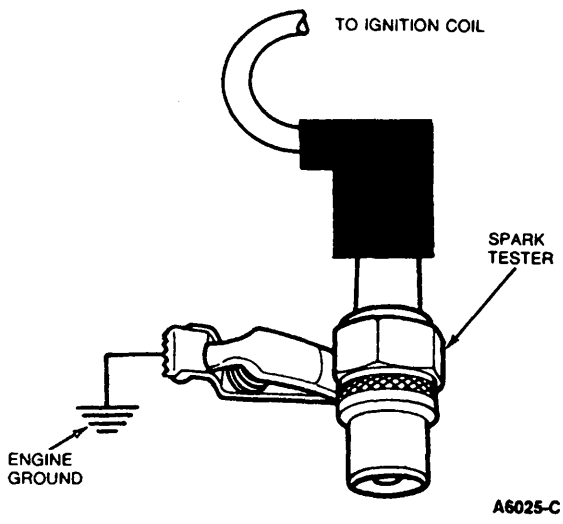
Ignition Coil Secondary Voltage — Crank Mode

TFI-IV Closed Bowl Distributor

Part 2 Test 1

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Connect spark tester between ignition coil wire and engine ground. 2. Crank engine. 3. **Was spark present?**	Yes ▶	Test result OK. INSPECT distributor cap and rotor for damage/carbon tracking. If engine starts, GO to Part 1, otherwise GO to Test 2.
	No ▶	INSPECT ignition coil for damage/carbon tracking. Crank engine to verify distributor rotation. REFER to Shop Manual, Group 23 (Group 3 for Compact Truck) and SERVICE as required. GO to Test 4.



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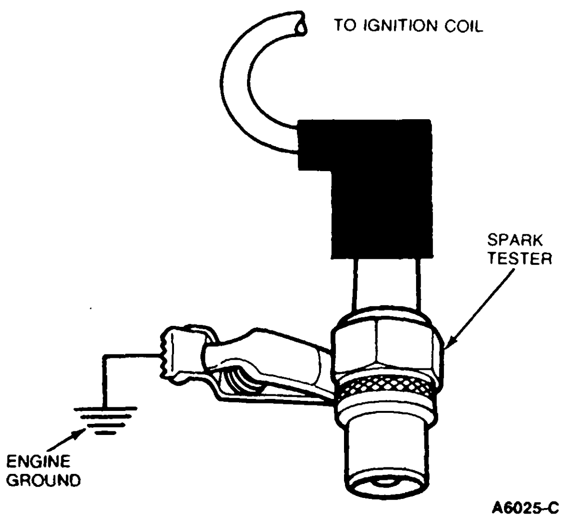
Ignition Coil Secondary Voltage — Run Mode	TFI-IV Closed Bowl Distributor	Part 2 Test 2

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Place the transmission shift lever in the PARK (A/T) or NEUTRAL (M/T) position and set the Parking Brake. CAUTION **Failure to perform this step may result in the vehicle moving when the starter is subsequently engaged during the test.**	Yes ▶	Test result OK. Problem is not in the ignition system primary circuit components. RETURN to the Diagnostic Routines to identify other possible causes.
2. Disconnect wire at S terminal of starter relay. 3. Attach remote starter switch. 4. Turn ignition switch to RUN position. 5. Crank the engine using remote starter switch. 6. Turn ignition switch to OFF position. 7. Remove the remote starter switch. 8. Reconnect wire to S terminal of starter relay. 9. **Was spark present?**	No ▶	GO to Test 3.



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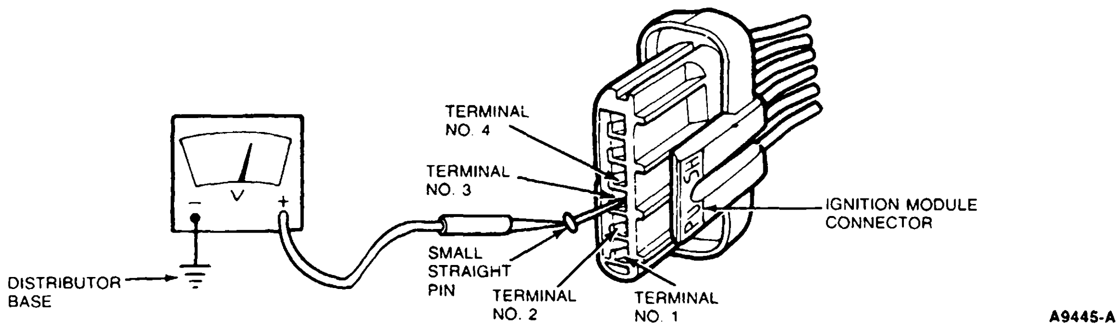
Wiring Harness

TFI-IV Closed Bowl Distributor

Part 2 Test 3

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Separate wiring harness connector from ignition module. Inspect for dirt, corrosion, and damage. **NOTE: Push connector tabs to separate.** 2. Disconnect wire at S terminal of starter relay. 3. Attach negative (−) VOM lead to distributor base. 4. Measure battery voltage. 5. Following table below, measure connector terminal voltage by attaching VOM to small straight pin inserted into connector terminal and turning ignition switch to position shown. CAUTION **Do not allow straight pin to contact electrical ground.** (see table below) 6. Turn ignition switch to OFF position. 7. Remove straight pin. 8. Reconnect wire to S terminal of starter relay. 9. **Was the voltage measured greater than 90 percent of battery voltage in each case?**	Yes ▶ No ▶	REPLACE the TFI module. INSPECT for faults in wiring harness and connectors. REFER to vehicle wiring diagram for appropriate circuit. Damaged or worn ignition switch. REFER to Shop Manual, Group 31 (Group 14 for Compact Truck).

Connector Terminal	Wire/Circuit	Ignition Switch Test Position
#3	Run Circuit	Run and Start
#4	Start Circuit	Start



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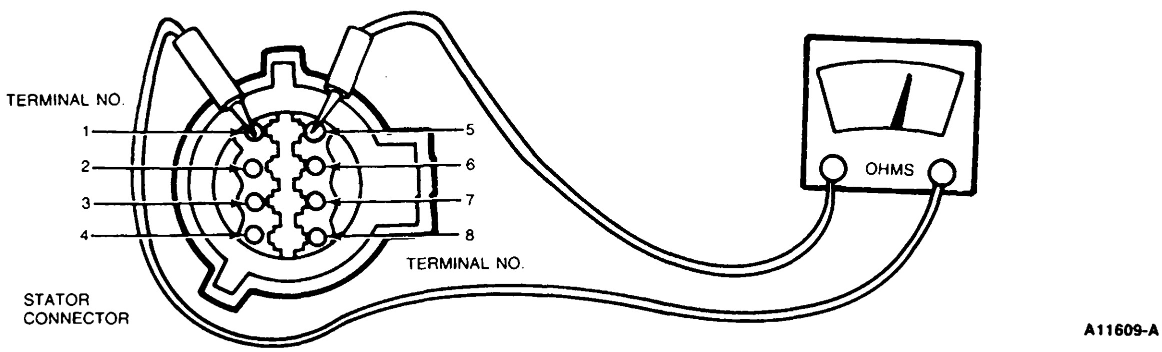
Stator	TFI-IV Closed Bowl Distributor	Part 2 Test 4

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Separate wiring harness connector from the distributor. Inspect for dirt, corrosion and damage. 2. Measure resistance between the stator connector terminals 1 and 5. 3. **Was the resistance between stator terminals 1 and 5 less than 5 ohms?**	Yes ▶ No ▶	GO to Test 5. REPLACE the stator.



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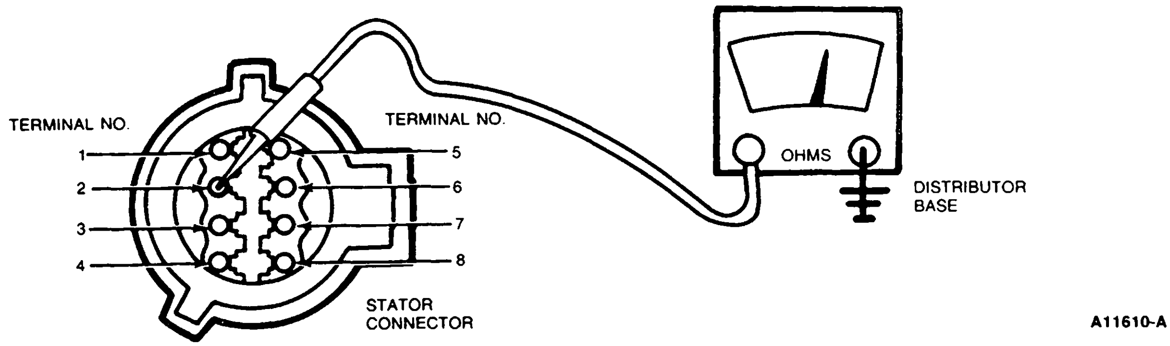
Stator	TFI-IV Closed Bowl Distributor	Part 2 Test 5

TEST STEP	RESULT	ACTION TO TAKE
1. Measure resistance between stator connector terminal 2 and the distributor base. 2. Measure resistance between stator connector terminal 6 and the distributor base. 3. **Was the resistance less than 1 ohm in each case?**	Yes ▶	GO to Test 6.
	No ▶	INSPECT the retaining screws to stator in the distributor bowl. If OK, REPLACE the stator.



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Stator	TFI-IV Closed Bowl Distributor	Part 2 Test 6

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Place the transmission shift lever in the PARK (A/T) or NEUTRAL (M/T) position and set the parking brake. CAUTION **Failure to perform this step may result in the vehicle moving when the starter is subsequently engaged during the test.** 2. Disconnect the harness connector from the TFI module and connect the TFI-IV tester to the stator and TFI module. 3. Connect the red lead from the tester to the positive (+) side of the battery. 4. Disconnect the wire at the S terminal of the starter relay, and attach remote starter switch. 5. Crank the engine using the remote starter switch and note the status of the two LED lights. 6. Remove the tester and remote starter switch. 7. Reconnect the wire to the starter relay. 8. **Did the PIP light blink?**	Yes ▶ No ▶	RECONNECT harness connectors to TFI module and distributor, then GO to Test 7. REPLACE the stator.

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TFI Module	TFI-IV Closed Bowl Distributor	Part 2 Test 7

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Use status of Tach light from Test 6. 2. **Did the Tach light blink?**	Yes ▶	GO to Test 8.
	No ▶	REPLACE the TFI module and CHECK for spark using the method described in Test 1. If spark is not present REPLACE the coil also.

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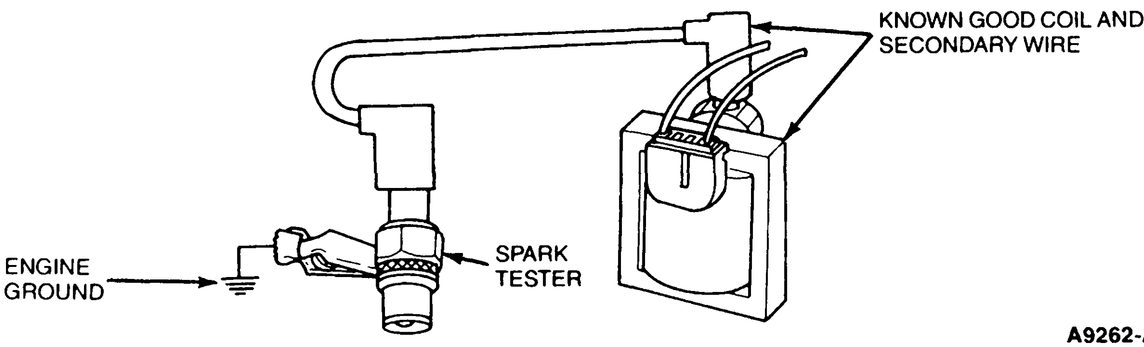
Ignition Coil And Secondary Wire

TFI-IV Closed Bowl Distributor

Part 2 Test 8

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Disconnect ignition coil connector. Inspect for dirt, corrosion and damage. 2. Connect the ignition coil connector to a known good ignition coil. 3. Connect one end of a known good secondary wire to the spark tester. Connect the other end to the known good ignition coil. CAUTION **DO NOT HOLD THE COIL while performing this test. Dangerous voltages may be present on the metal laminations as well as the high voltage tower.** 4. Crank engine. 5. Turn ignition switch to OFF position. 6. **Was spark present?**	Yes ▶	MEASURE resistance of the ignition coil wire (from vehicle), if greater than 7,000 ohms per foot. If OK, REPLACE ignition coil.
	No ▶	RECONNECT coil connector to the vehicle coil and spark tester to vehicle secondary wire and GO to Test 9.



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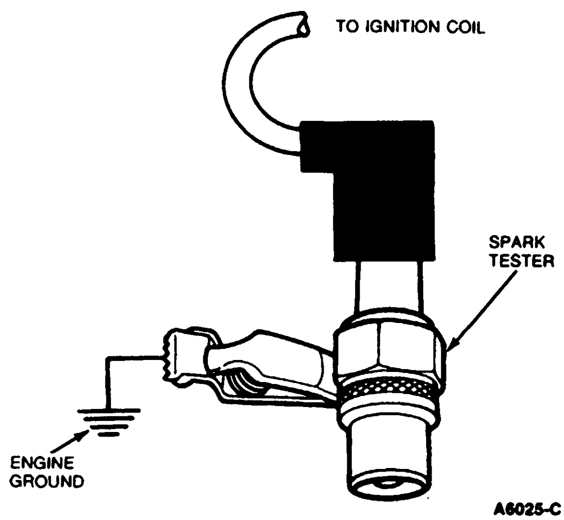
EEC-IV — Wiring	TFI-IV Closed Bowl Distributor	Part 2 Test 9

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Disconnect the in-line connector near the TFI module. 2. Crank the engine. 3. **Was spark present?**	Yes ▶	Check PIP-A and IGN GND signal wires for continuity to EEC. SERVICE as necessary. If OK, GO to EEC-IV Diagnostics.
	No ▶	GO to Test 10.



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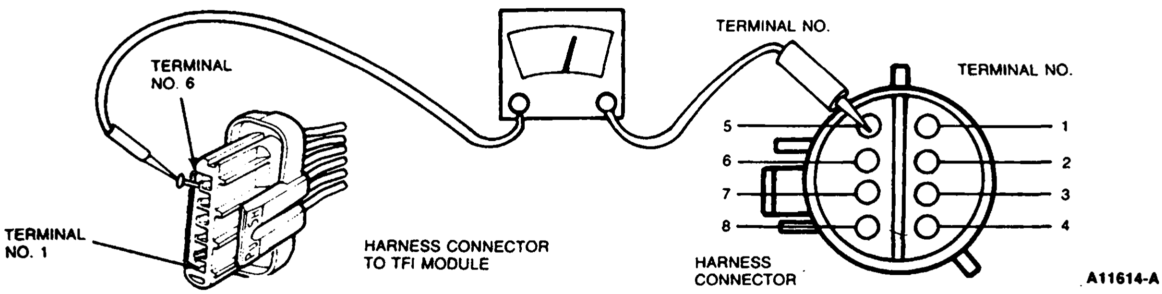
Wiring Harness	TFI-IV Closed Bowl Distributor	Part 2 Test 10

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Separate wiring harness connector from distributor and from the TFI module. 2. Measure resistance between terminal No. 5 of the harness connector which connects to the distributor and terminal No. 6 of the harness connector which connects to the TFI module by inserting a small straight pin. 3. **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to Test 11. INSPECT and SERVICE wiring between the distributor and TFI module (PIP-B circuit).



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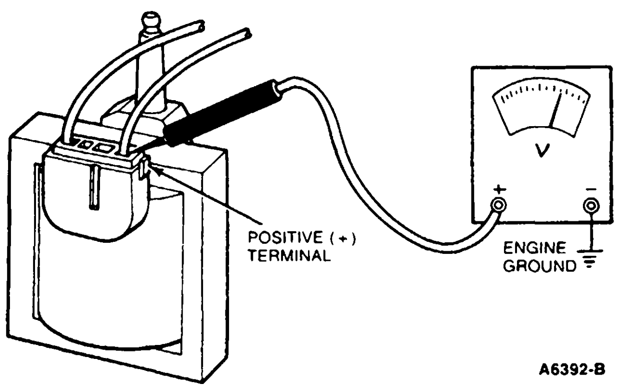
Ignition Coil Supply Voltage	TFI-IV Closed Bowl Distributor	Part 2 Test 11

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Attach negative (−) VOM lead to distributor base. 2. Measure battery voltage. 3. Turn ignition switch to RUN position. 4. Measure voltage at positive (+) terminal of ignition coil. 5. Turn ignition switch to OFF position. 6. **Was the voltage at coil positive terminal at least 90 percent of battery voltage?**	Yes ▶	INSPECT ignition coil harness connector for dirt, corrosion, and damage. INSPECT ignition coil terminals for dirt, corrosion, and damage. GO to Test 12.
	No ▶	INSPECT and SERVICE wiring between ignition coil and ignition switch. REFER to vehicle wiring diagram. Worn or damaged ignition switch. REFER to Shop Manual, Group 31 (Group 14 for Compact Truck).



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TFI Supply Voltage

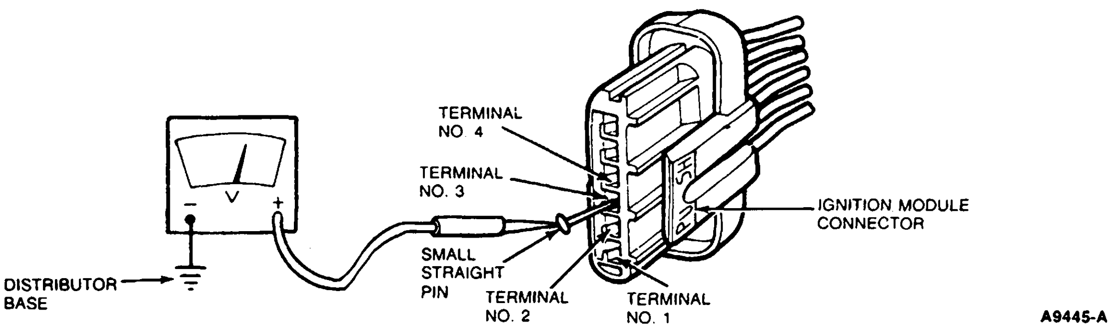
TFI-IV Closed Bowl Distributor

Part 2 Test 12

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Disconnect wire at S terminal of starter relay. 2. Attach negative (−) VOM lead to distributor base. 3. Measure battery voltage. 4. Following table below, measure connector terminal voltage by attaching VOM to small straight pin inserted into connector terminal and turning ignition switch to position shown. CAUTION **Do not allow straight pin to contact electrical ground.**	Yes ▶	Test result OK. GO to Test 13.
	No ▶	INSPECT for faults in wiring harness and connectors. REFER to vehicle wiring diagram for appropriate circuit. Damaged or worn ignition switch. REFER to Shop Manual, Group 31 (Group 14 for Compact Truck).

Connector Terminal	Wire/Circuit	Ignition Switch Test Position
#3	Run Circuit	Run and Start
#4	Start Circuit	Start

5. Turn ignition switch to OFF position.
6. Remove straight pin.
7. Reconnect wire to S terminal of starter relay.
8. **Was the voltage measured in each case greater than 90 percent of battery voltage?**



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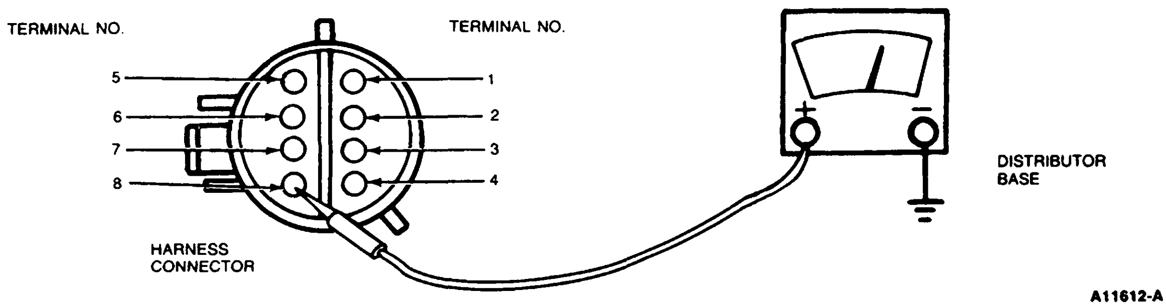
Stator Supply Voltage

TFI-IV Closed Bowl Distributor

Part 2 Test 13

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Attach negative (−) VOM lead to distributor base. 2. Measure battery voltage. 3. Turn ignition switch to RUN position. 4. Measure voltage at terminal 8 of the harness connector which connects to the stator. 5. Turn ignition switch to the OFF position. 6. **Was the result greater than 90 percent of battery voltage?**	Yes ▶	GO to Test 14.
	No ▶	INSPECT and SERVICE wiring between stator and ignition switch. REFER to vehicle wiring diagram. Worn or damaged ignition switch. REFER to Shop Manual, Group 31 (Group 14 for Compact Truck).



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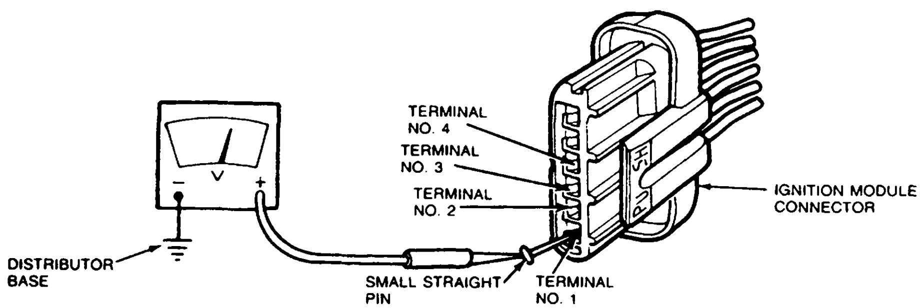
Wiring Harness	TFI-IV Closed Bowl Distributor	Part 2 Test 14

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Reconnect the wiring harness connector to the distributor. 2. Measure resistance between the distributor base and terminal No. 1 of the harness connector at the ignition module. 3. **Is the resistance less than 1 ohm?**	Yes ▶	INSPECT for faults in wiring between the coil and TFI module terminal No. 2 or any additional wiring or components connected to that circuit. REFER to vehicle wiring diagram.
	No ▶	INSPECT and SERVICE wiring between the harness connector at the ignition module and the harness connector at the distributor (GND circuit).



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INTERMITTENT DIAGNOSIS PROCEDURE

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Preliminary Checkout and Notes

NOTES

- *This procedure begins with an owner complaint that the engine stops at unexpected times but can be restarted. In situations like this there are two things that are very important. The technician must obtain as much information directly from the owner about the conditions under which the problem occurs, and the service history of the vehicle must be thoroughly reviewed to avoid repeat replacement of good components. For example, replacing a stator assembly a second time will not correct a problem if the problem is actually in another area.*

- Two testers are available for assistance with intermittent diagnosis. **Rotunda Ignition System Tester D80L-50-BIT** is used to diagnose problems in the primary circuit of the Duraspark ignition systems. It provides a means to direct the technician to a specific area in the primary circuit. **Rotunda Ignition System Tester 007-00008** provides a quick means of separating primary ignition system problems from fuel, carburetion, EGR or other system problems causing similar vehicle symptoms. It can be used on most ignition systems. It will detect any primary ignition system problem, but it is particularly useful in detection of intermittent problems.

CHECKOUT

- Visually inspect the engine compartment to ensure all vacuum hoses and spark plug wires are properly routed and securely connected.

- Examine all wiring harnesses and connectors for insulation damage, burned, overheated, loose or broken conditions.

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Intermittent Diagnosis

TEST STEP	RESULT	ACTION TO TAKE
STEP 1		
• Talk to owner.	▶	Symptoms.
STEP 2		
• Review vehicle service history.	▶	Number of previous repairs and components replaced.
STEP 3		
• **Is a Rotunda Ignition System Tester model, 007-00008 or equivalent available?**	Yes ▶	FOLLOW test procedure instructions supplied with tester.
	No ▶	GO to Step 4.
STEP 4		
• **Will engine start?**	Yes ▶	GO to Step 5.
	No ▶	GO to Ignition System Diagnostic Procedure, Part 2, Test 1 for engine ignition system (Duraspark II, or TFI-IV).
STEP 5		
• Engine at idle, raise hood, shake wiring harness and pull wires at connectors for ignition components. **Does engine quit?**	Yes ▶	SERVICE wiring harness or connector.
	No ▶	GO to Step 6.
STEP 6		
• Engine at idle, close hood, A/C On, blower on medium speed: allow engine to run for 15 minutes. **Does engine quit?**	Yes ▶	GO to Step 10.
	No ▶	GO to Step 7.

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Intermittent Diagnosis

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 7		
• Engine off, hood closed, hot soak for 10 minutes. **Will engine restart?**	Yes ▶	GO to Step 8.
	No ▶	GO to Ignition System Diagnostic Procedure, Part 2, Test 1 for engine ignition system (Duraspark II, or TFI-IV).
STEP 8		
• Engine at idle, raise hood, shake wiring harness and pull wires at connectors for ignition components. **Does engine quit?**	Yes ▶	SERVICE wiring harness or connector.
	No ▶	GO to Step 9.
STEP 9		
• Road test. **Does engine quit?**	Yes ▶	GO to Step 10.
	No ▶	Test complete. (Problem not duplicated).
STEP 10		
• Raise hood, shake wiring harness, pull wires at connectors, separate and reconnect connectors for ignition components. **Does engine start?**	Yes ▶	SERVICE wiring harness or connector.
	No ▶	GO to Ignition System Diagnostic Procedure, Part 2, Test 1 for engine ignition system (Duraspark II, or TFI-IV).

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IGNITION SYSTEM DIAGNOSTIC PROCEDURE (DIS) 2.3L EFI TRUCK (DUAL PLUG)

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Index

**NOTE: Start all diagnostics with Section 14 (EEC) first. The tests in this Section are dependent on results from tests conducted in Section 14.
The tests in this Section are designed to be performed in sequence. Do not jump ahead unless directed to from the EEC Section.**

Service Index

- If engine does not start, begin at TEST 1, Step 7.
- If engine starts, begin at TEST 1, Step 1.
- If cranking is not smooth and regular, start at TEST 1, Step 4.
- If timing light does not trigger, start at TEST 1, Step 7.
- If KOER 88 and there are no drive complaints, start at TEST 3, Step 17.
- If KOER 48 and there are no other codes or drive complaints, start at TEST 1, Step 6.

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Preliminary Checkout, Equipment and Notes

CHECKOUT

- Visually inspect the engine compartment to ensure all vacuum hoses and spark plug wires are properly and securely connected.
- Examine all wiring harnesses and connectors for insulation damage, and burned, overheated, damaged pins, loose or broken conditions. Check sensor shield connector. Make sure DIS Module mounting screws are tight.
- Be certain the battery is fully charged.
- All accessories should be off during diagnosis.

EQUIPMENT (Required)

Obtain the following test equipment or an equivalent:

- DIS Diagnostic Cable (Hickok HK-100-306 or equivalent).
- Spark Plug Firing Indicator (Champion CT-436 or equivalent).
- Volt/Ohm Meter (Rotunda 014-00407) or equivalent).
- 12-14 Volt Test lamp.
- Remote starter switch.
- EEC IV breakout box (Rotunda T83L-50-EEC-IV or equivalent).
- Spark Gap type spark tester (Special Service Tool D81P-6666-A).
- Inductive Timing Light (Rotunda 059-00006 or equivalent). A spark plug with a broken side electrode is not sufficient to check for spark and may lead to incorrect results.

EQUIPMENT (Recommended)

- Dis Module Tester Hickok Model 600. This Tester Contains 12 Leds, 12 Test Jacks and a built in interface cable, that allows the tester to monitor all DIS Module signals.
- DIS Coil/Sensor Tester Hickok Model 601. This tester is similar to the Model 600 except it allows monitoring of signals at the sensor and coils.

NOTES

- When making measurements on a wiring harness, both a visual inspection and a continuity test should be performed. Inspect the connector pins for damage (corrosion, bent or spread pins etc.) when directed to remove a connector.
- Spark timing adjustments are not possible.
- When making voltage checks a GROUND reading means any value within a range of 0 to 1 volt. Also VBAT readings mean any value that falls within a range of VBAT to 2 volts less than VBAT.
- When using the spark plug firing indicator, place the grooved end as close as possible to the plug boot. Very weak flashing may be caused by a fouled plug.

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DIS Diagnostic Cable

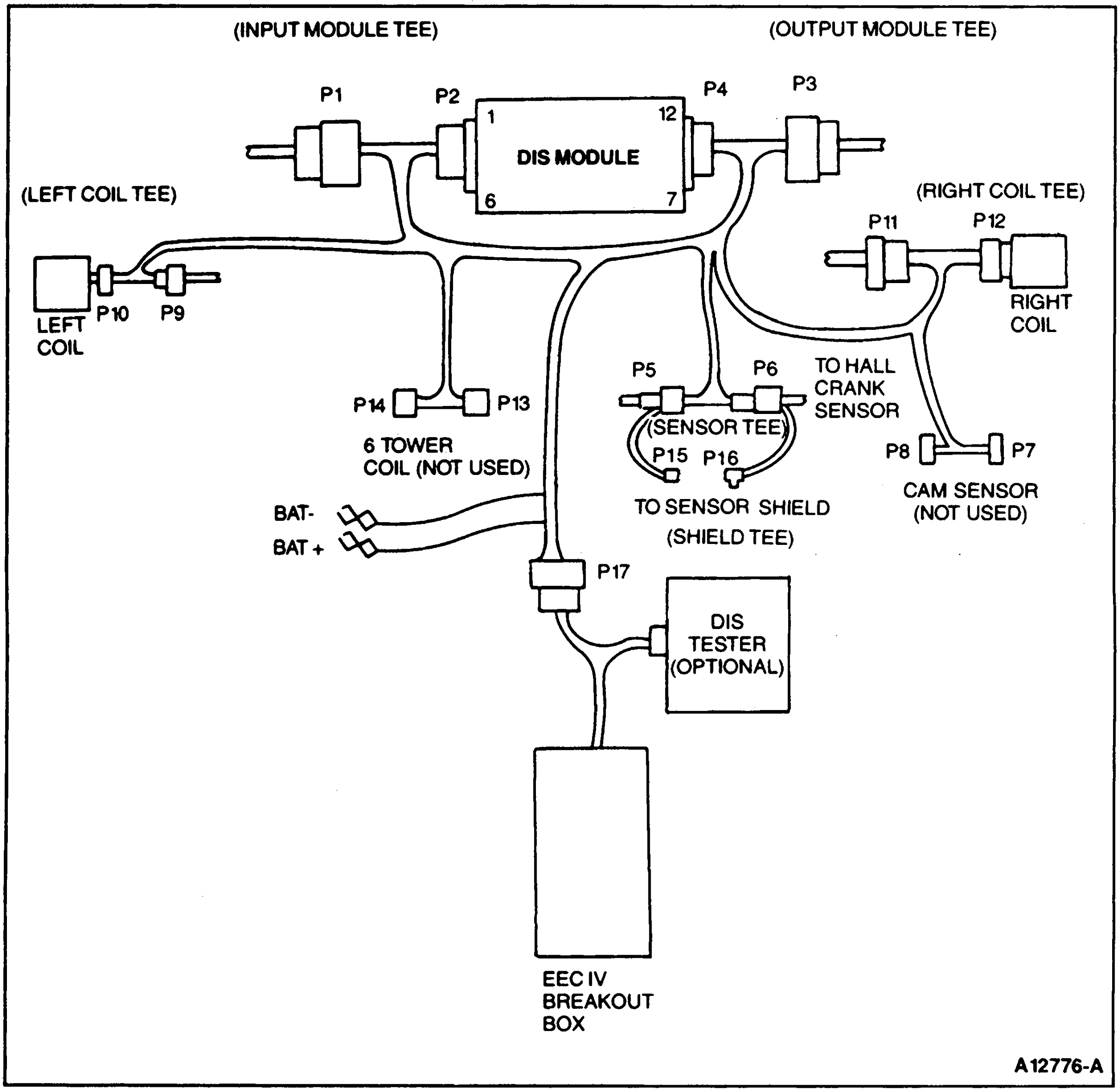

Figure 1

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DIS Module Pin Out

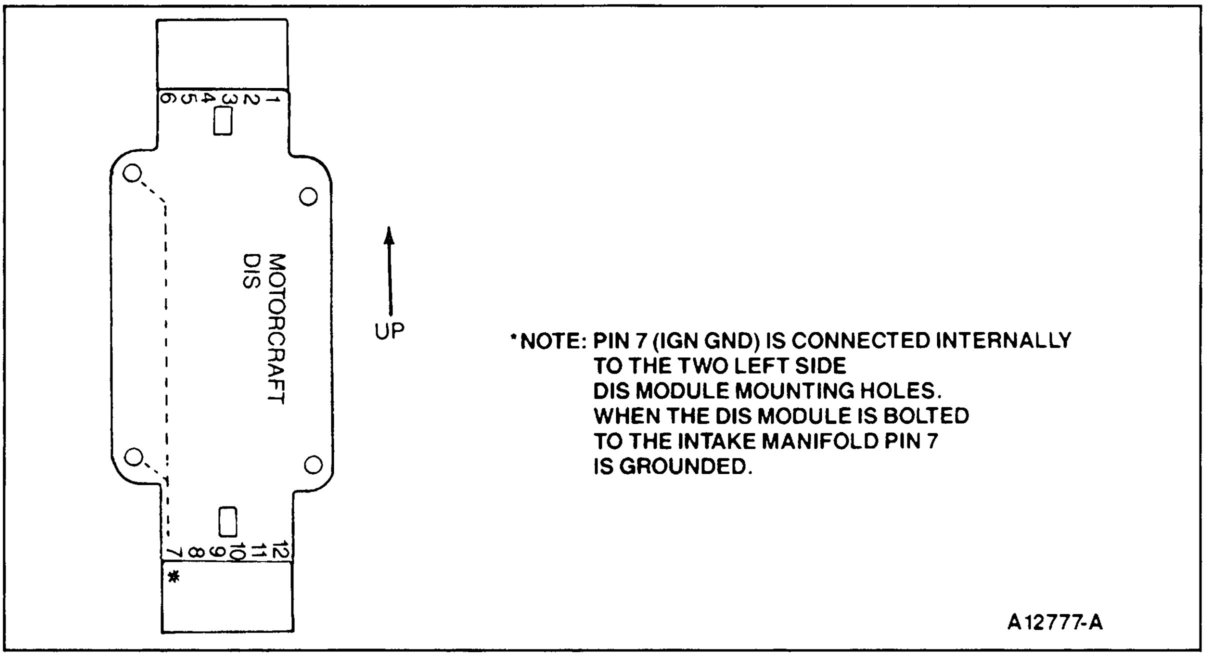

Figure 2

PIN #	4 CYL-DUAL SPARK
1	VBAT
2	CID
3	PIP Out
4	PIP In
5	SPOUT
6	DPI
7	IGN GROUND
8	COIL 3
9	COIL 4
10	COIL 2
11	COIL 1
12	IDM

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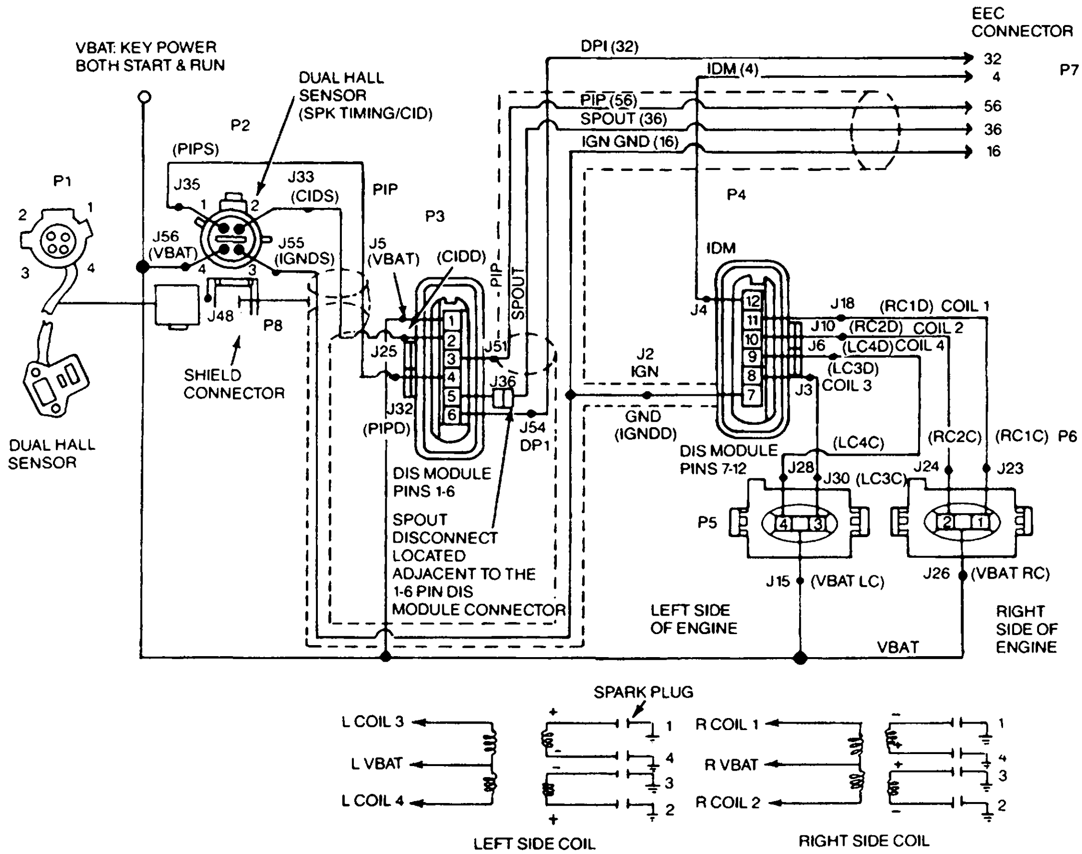
DIS Wiring Schematic

2.3L EFI Truck (Dual Plug)



NOTE: CONNECTORS ARE SHOWN LOOKING INTO THE WIRING HARNESS.
IGN GND IS A LOW CURRENT REFERENCE FOR THE EEC IV AND DIS MODULE.
IT IS CONNECTED TO BATTERY NEGATIVE (GROUND) VIA THE DIS MODULE METAL BASE PLATE. PROPER SYSTEM OPERATION DEPENDS ON A LOW RESISTANCE PATH.

A12778-A

Figure 3

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Sensor Description

The Dual Hall crankshaft sensor contains two Hall digital output devices (PIP, CID) in one package. The sensor is located on a bracket mounted near the crankshaft damper.

Two rotary vane cups (or wheels) are mounted on the damper and are used to trigger the Hall sensors. The vane cups are made of ferrous metal. When the window of a cup is in the air gap between the Hall device and the permanent magnet, a magnetic flux field is completed from the magnet through the Hall device and back to the magnet. This condition results in a low (0 volt) output signal (Figure 4). As the crankshaft turns, a tooth on the cup will move into the air gap. The magnet field will be shunted by the tooth (Figure 5) preventing it from reaching the hall device and the output signal will change from a low to a high (VBAT).

The PIP cup has two teeth resulting in a Two positive going edges each revolution of the crankshaft, where as the CID cup has one tooth and generates a signal that is high half of the crank revolution and low for the other. CID is used by the DIS module to enable it to select the proper coils to fire. When CID is High coils 2 and 3 are enabled and when CID is low 1 & 4 are enabled. The EEC IV tells the DIS module when to fire but the DIS module has to select one of the two coils based on CID (which two of four if in the DPI mode).

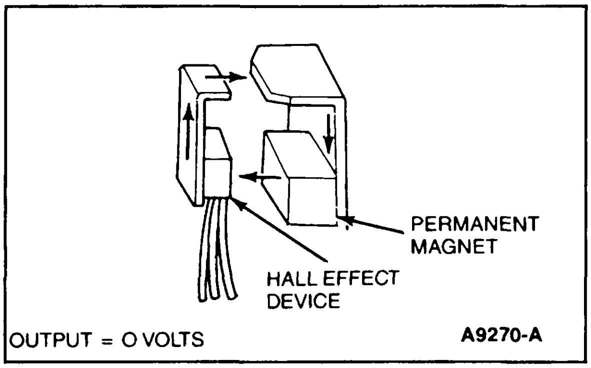

Figure 4 Magnetic Flux Field

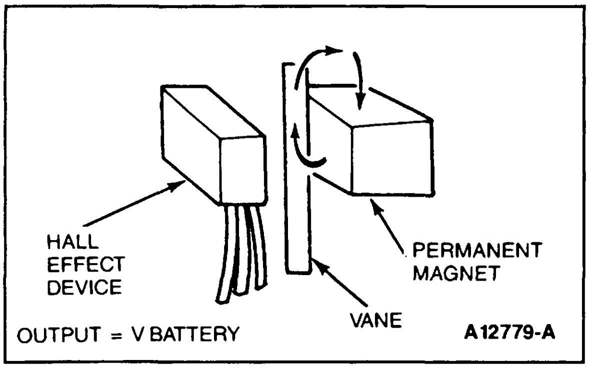

Figure 5 Hall Effect Device Response to Vane

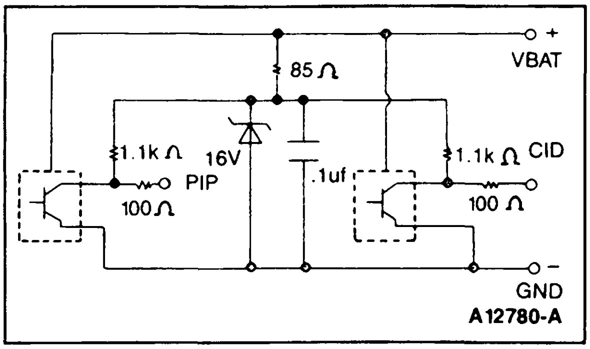

Figure 6 Crank Sensor Output Circuit

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2.3L Dual Plug DIS System Description

The Ford DIS 4-2 system (refer to Figure 7) consists of a crankshaft mounted Dual hall Sensor, two 4-tower DIS coils, and a DIS ignition module.

The DIS ignition system eliminates the need for a distributor by using multiple coils (each coil fires two spark plugs at the same time). The plugs are paired so that as one fires during the compression cycle the other fires during the exhaust stroke. The next time the coil is fired, the plug that was on exhaust will be on compression and the one that was on compression will be on exhaust (the spark in the exhaust cylinder is wasted but little of the coil energy is lost). Two coils are mounted together in a "coil pack" each pack has two tach wires, one for each coil. Since there are two plugs per cylinder, two coil packs are required. One is called the Right Coil (on right side of engine) and the other, the Left Coil (left side). The right coil and plugs operate continuously but the left hand coil and plugs may be switched on or off by the EEC IV computer. The EEC-IV computes the spark angle and dwell for the ignition system.

The crank sensor is a dual digital output Hall device that responds to two rotating metallic shutters mounted together on the crankshaft. The PIP output is a 50% duty cycle signal that provides base spark timing information. The other signal (CID) is required so that the DIS module "knows" which coil to fire. CID is high (VBAT) half of the crank revolution (180 degrees) and low (0 volts) for the other (refer to Figure 8).

The EEC-IV determines spark angle using the PIP signal to establish base timing. Spout is sent from the EEC to the DIS module and serves two purposes; the leading edge fires the coil and the trailing edge controls the dwell time. This feature is called CCD or computer controlled dwell.

The Ignition Diagnostic Monitor (IDM) is an output from the DIS module to the EEC IV Module that provides diagnostic information about the ignition system for self test.

Dual Plug Inhibit (DPI) allows the EEC to switch the ignition system from single to dual plug operation.

During crank the vehicle is in the single plug mode (only the plugs on the right side of the engine are working). The EEC IV sends a command to the DIS module to switch to the Dual plug mode (both plugs in each cylinder working) when the engine has started.

If the CID circuit fails, the DIS module will randomly select one of the two coils to fire. If hard starting results, turning the key off and then cranking again will result in another "guess." Several attempts may be needed until the proper coil is selected, allowing the vehicle to be started and driven until repairs can be made. The Failure Effects Management system will keep the vehicle drivable in the event of EEC or ignition failures that would otherwise prevent spark angle or dwell commands. The EEC IV opens the SPOUT line and the DIS Module fires the coils directly from the PIP output. This results in a fixed spark angle of 10 degrees and fixed dwell.

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DIS Block Diagram

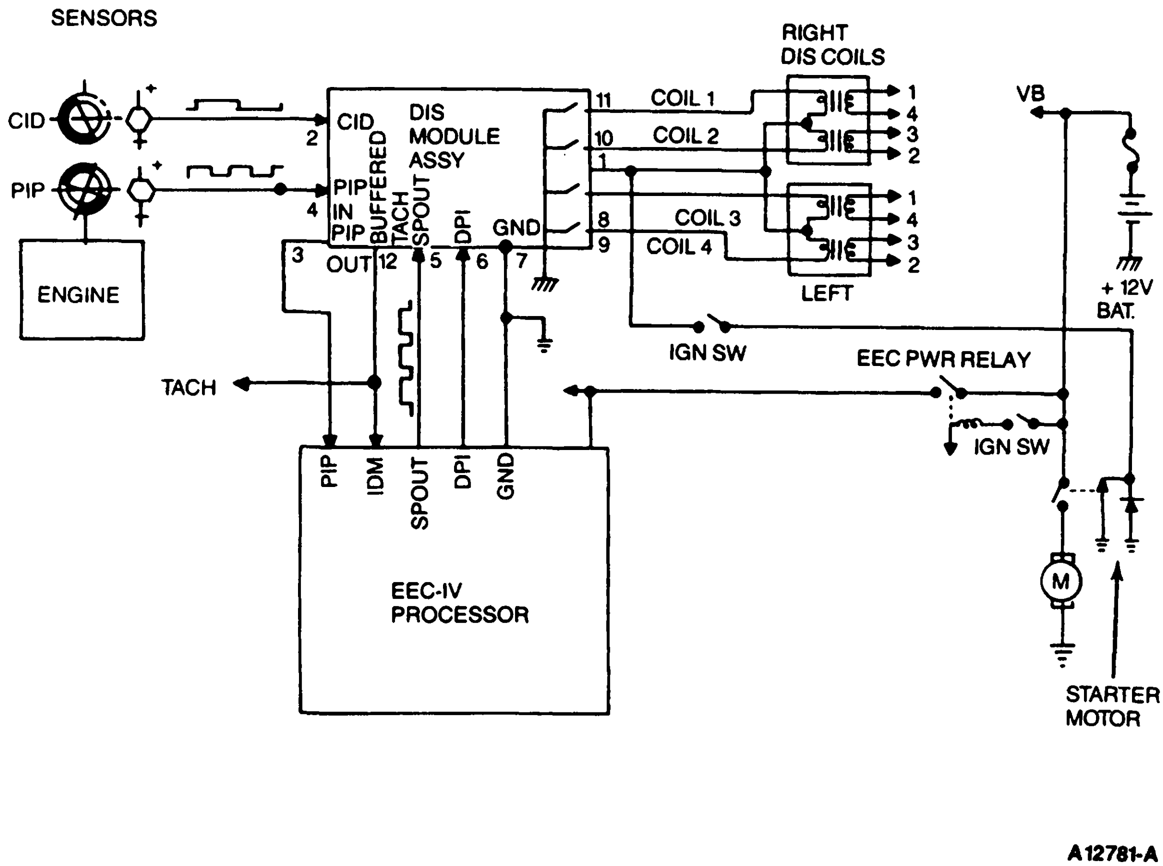

Figure 7

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DIS Waveforms

Timing Diagram

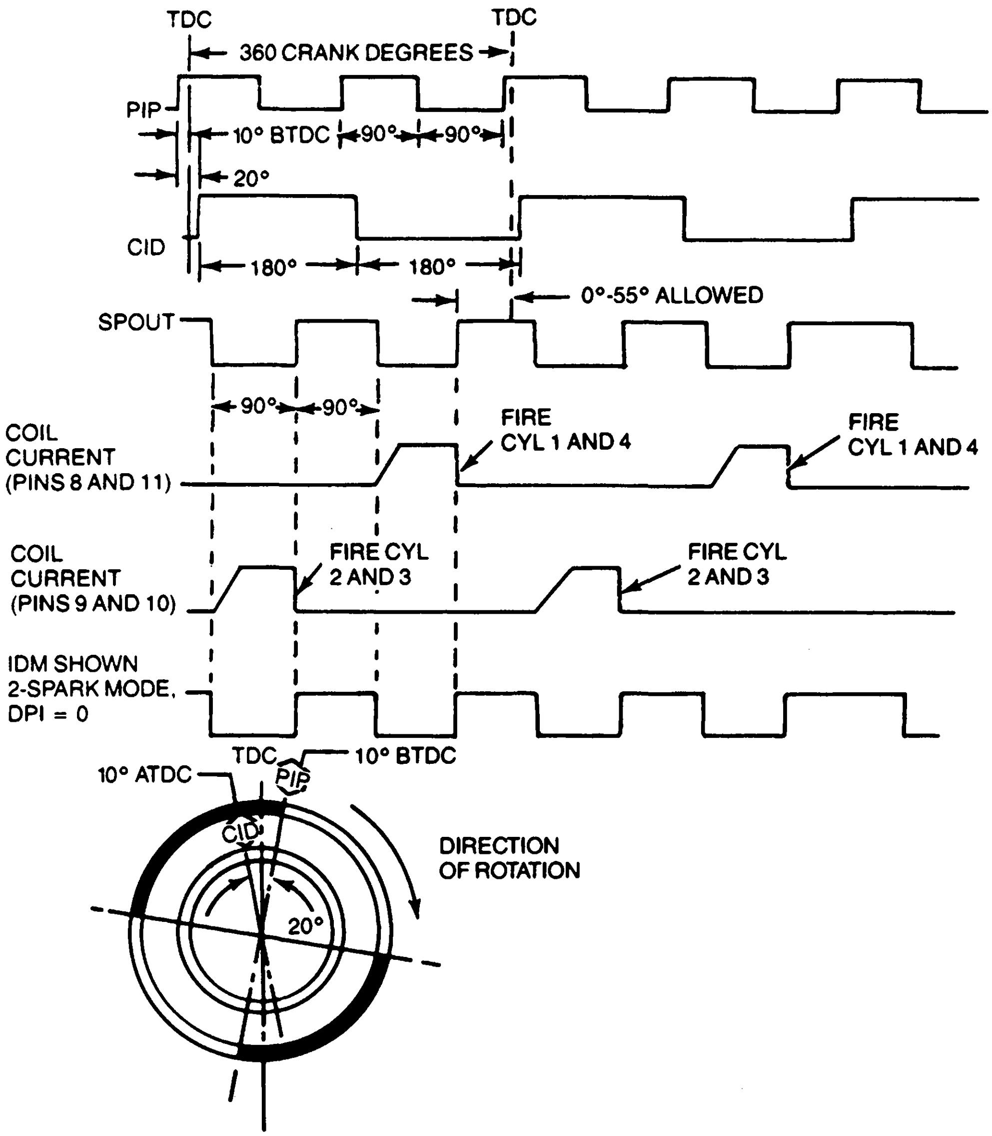

Figure 8

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2.3L DP DIS Ignition System

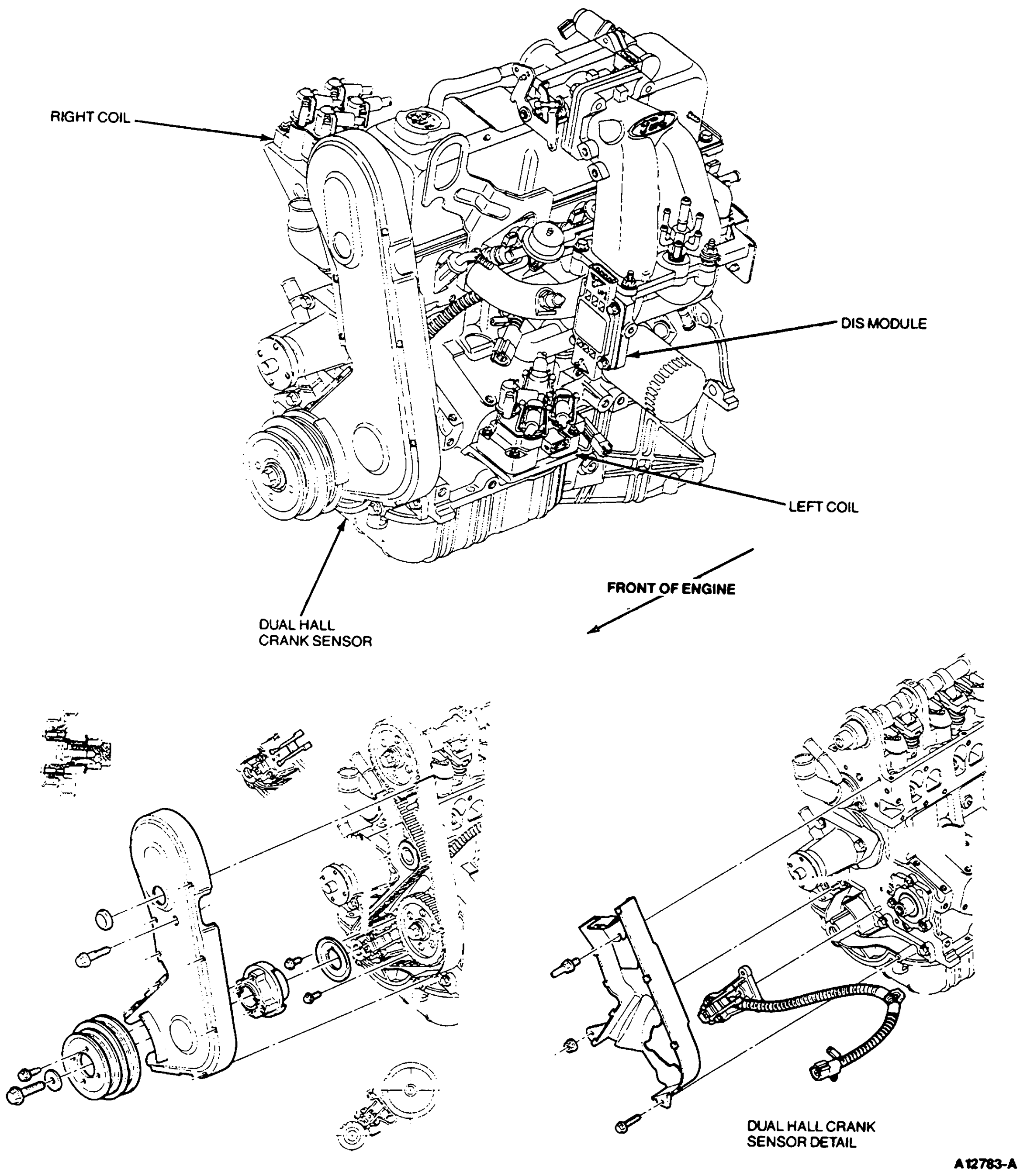

Figure 9 DP DIS Parts Location

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System Function | 2.3L DP | Test 1

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 1		
• **Is the spark angle 10 degrees BTDC (± 3 degrees) with the SPOUT jumper disconnected?**	Yes ▶	GO to Step 2.
	No ▶	GO to Step 3.
STEP 2		
• **Is the spark angle 30 degrees BTDC (± 4 degrees) with the SPOUT jumper connected (during self test)?**	Yes ▶	GO to Step 4.
	No ▶	REPLACE DIS module.
STEP 3		
• Inspect the vane cups (located on the back of the damper). **Are they bent or otherwise damaged?**	Yes ▶	REPLACE or repair.
	No ▶	REPLACE Crank Sensor.
STEP 4		
• **Is cranking smooth and regular (does not backfire or pause)?**	Yes ▶	GO to Step 7.
	No ▶	GO to Step 5.
STEP 5		
• **Is there continuous spark at all right plug wires (use neon bulb spark tester) during crank or engine running?**	Yes ▶	GO to Step 6.
	No ▶	GO to Step 9.
STEP 6		
• Install the DIS diagnostic cable and EEC breakout box. Measure the voltage between J51 (CIDD) and J2 (IGNGNDD) while cranking the engine in very short bursts. **Are two voltages, 0 and +12 VDC observed during crank or 6.4 VDC (± 1 VDC) if engine runs?**	Yes ▶	GO to Test 2, Step 31.
	No ▶	GO to Test 3, Step 1.
STEP 7		
• **Is there continuous spark at all of the right plug wires during crank or engine running?**	Yes ▶	GO to Step 8.
	No ▶	GO to Step 9.

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System Function | 2.3L DP | Test 1

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 8		
• **Is there continuous spark at all of the left plug wires (engine running)?**	Yes ▶	Ignition OK, GO to Section 2.
	No ▶	GO to Step 12.
STEP 9		
• **Using the air gap spark tester at the right coil, Is there good quality (blue) sparks at all four coil towers?**	Yes ▶	GO to Step 11.
	No ▶	GO to Test 2, Step 1.
STEP 10		
• **Is the resistance of the right plug wires less than 30K ohms?**	Yes ▶	GO to Step 11.
	No ▶	REPLACE bad wires.
STEP 11		
• **Inspect the right plugs. Are they OK?**	Yes ▶	GO to Test 2, Step 1.
	No ▶	REPLACE bad plugs.
STEP 12		
• **Is the resistance of the left plug wires less than 30K ohms?**	Yes ▶	GO to Step 13.
	No ▶	REPLACE bad wires.
STEP 13		
• **Inspect the left plugs. Are they OK?**	Yes ▶	GO to Test 2, Step 1.
	No ▶	REPLACE bad plugs.
STEP 14		
• Install the DIS Diagnostic Cable and EEC Breakout Box. Measure the voltage between J32 (PIPD) and the negative terminal of the battery while cranking the engine in very short bursts. **Are two voltages, 0 and VBAT observed or 6.5 (± 1) VDC if engine runs?**	Yes ▶	GO to Step 15.
	No ▶	GO to Step 17.

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System Function | 2.3L DP | Test 1

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 15		
• **Is the resistance between J32 (PIPD) and J51 (PIP) less than 5 ohms?**	Yes ▶	Crank Sensor OK, GO to Section 2.
	No ▶	GO to Step 16.
STEP 16		
• Remove the DIS Module. • **Is the resistance between pins 3 and 4 less than 5 ohms?**	Yes ▶	REPAIR DIS connector.
	No ▶	REPLACE Module.
STEP 17		
• Measure the voltage between J35 (PIPS) and the negative terminal of the battery while cranking the engine in very short bursts. **Are two voltages 0 and VBAT observed or 6.5 (± 1) VDC if engine runs?**	Yes ▶	PIP open in harness.
	No ▶	GO to Step 18.
STEP 18		
• **Is the voltage between J56 (VBATS) and the negative of the battery more than 11 VDC key on?**	Yes ▶	GO to Step 19.
	No ▶	VBAT open, REPAIR harness.
STEP 19		
• **Is the resistance between J55 (IGNDS) and the negative terminal of the battery less than 5 ohms key off?**	Yes ▶	GO to Step 20.
	No ▶	IGND open, REPAIR harness.
STEP 20		
• Disconnect the DIS Module from the DIS Input and repeat Step 17. **OK now?**	Yes ▶	REPLACE DIS Module.
	No ▶	GO to Step 21.
STEP 21		
• Disconnect the Sensor from the Sensor TEE. **Is the resistance between J35 (PIPS) and J51 (PIPD) less than 5 ohms key off?**	Yes ▶	GO to Step 22.
	No ▶	PIP open, REPAIR harness.

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System Function | 2.3L DP | Test 1

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 22		
• **Is the resistance between J35 (PIPS) and J56 (VBATS) more than 10K key off?**	Yes ▶	GO to Step 23.
	No ▶	PIP shorted to VBAT, REPAIR harness.
STEP 23		
• **Is the resistance between J35 (PIPS) and J55 (IGNDS) more than 10K key off?**	Yes ▶	REPLACE Sensor.
	No ▶	PIP shorted to ground. REPAIR harness.
STEP 24		
• Using timing light, check engine timing, warm engine, out of gear at 2000 RPM. **Is spark angle more than 18 degrees BTDC?**	Yes ▶	CHECK IDM circuit. GO to Section 15.
	No ▶	REPLACE DIS Module.

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DIS Module, Harness And Coil | 2.3L DP | Test 2

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 1		
• Install the DIS diagnostic cable and EEC breakout box. • Jumper J-54 (DPI) to J2 (IGNGNDD) on the breakout box. • **Is there continuous spark at any of the four right plug wires?**	Yes ▶ No ▶	GO to Step 8. GO to Step 2.
STEP 2		
• **Is the voltage between J5 (VBATD) and the negative terminal of the battery more than 11 VDC with the key on?**	Yes ▶ No ▶	GO to Step 3. GO to Step 31.
STEP 3		
• Measure the voltage between J32 (PIPD) and J2 (IGNGND) while cranking the engine in very short bursts. • **Are two voltages (0 and VBAT) observed during crank or 6.5 (± 1 VDC) if engine runs?**	Yes ▶ No ▶	GO to Step 4. GO to Test 3, Step 8.
STEP 4		
• Measure the voltage between J51 (CIDD) and J2 (IGNDD) while cranking the engine in very short bursts. • **Are two voltages (0 and VBAT VDC) observed during crank or 6.5 (± 1 VDC) if engine runs?**	Yes ▶ No ▶	GO to Step 5. GO to Test 3, Step 1.
STEP 5		
• **Is the resistance between J2 (IGNDD) and the negative terminal of the battery less than 5 ohms (key off)?**	Yes ▶ No ▶	GO to Step 6. REPAIR ground circuit. (See Figure 2.)
STEP 6		
• Connect the test light between J23 (RC1C) and J5 (VBATD). Crank the engine. **Does the light blink continuously?**	Yes ▶ No ▶	GO to Step 7. GO to Step 15.
STEP 7		
• Move the lead from J23 to J24 (RC2C). Crank the engine. **Does the light blink continuously?**	Yes ▶ No ▶	GO to Step 9. GO to Step 10.

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DIS Module, Harness And Coil | 2.3L DP | Test 2

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 8		
• Connect the test light between J28 (LC4C) and J5 (VBATD). Crank the engine. **Does the light blink continuously?**	Yes ▶ No ▶	GO to Step 20. GO to Step 26.
STEP 9		
• **Is the voltage between J26 (RCVBAT) + and J2 (IGNDD) – more than 11 VDC (key on)?**	Yes ▶ No ▶	REPLACE right coil. RCVBAT is bad. REPAIR harness.
STEP 10		
• Move the lead from J24 (RC2C) to J10 (RC2D) and crank the engine. **Does the light blink continuously?**	Yes ▶ No ▶	RC2 is open. REPAIR harness. GO to Step 11.
STEP 11		
• **Is the resistance between J24 (RC2C) and J10 (RC3D) less than 5 ohms?**	Yes ▶ No ▶	GO to Step 12. RC2 is open. REPAIR harness.
STEP 12		
• Disconnect the right coil from the right coil tee. Crank the engine. **Does the light blink continuously?**	Yes ▶ No ▶	REPLACE right coil. GO to Step 13.
STEP 13		
• Disconnect the DIS module from the output tee. **Is the resistance between J24 (RC2C) and the negative terminal of the battery more than 10K?**	Yes ▶ No ▶	GO to Step 14. RC2 is shorted to ground, REPAIR harness.
STEP 14		
• **Is the resistance between J24 (RC2C) and J5 (VBATD) more than 10K ohms (key off)?** • Reconnect module and coil.	Yes ▶ No ▶	REPLACE DIS module. RC2 is shorted to VBAT. REPAIR harness.

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DIS Module, Harness And Coil | 2.3L DP | Test 2

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 15		
• Move the lead from J23 (RC1C) to J18 (RC1D). Crank the engine. **Does the light blink continuously?**	Yes ▶	RC1 is open. REPAIR harness.
	No ▶	GO to Step 16.
STEP 16		
• REMOVE the right coil from the right coil TEE. Crank the engine. **Does the light blink continuously?**	Yes ▶	REPLACE right coil.
	No ▶	GO to Step 17.
STEP 17		
• **Is the resistance between J23 (RC1C) and J18 (RC1D) less than 5 ohms?**	Yes ▶	GO to Step 18.
	No ▶	RC1 is open. REPAIR harness.
STEP 18		
• Remove the DIS module from the DIS output TEE. **Is the resistance between J23 (RC1C) and the negative terminal of the battery more than 10K ohms with the key off?**	Yes ▶	GO to Step 19.
	No ▶	RC1 is shorted to GROUND. REPAIR harness.
STEP 19		
• **Is the resistance between J23 (RC1C) and J5 (VBATD) more than 10K ohms?** • Reconnect coil and module.	Yes ▶	REPLACE DIS module.
	No ▶	RC1 is shorted to VBAT. REPAIR harness.
STEP 20		
• Move the lead from J28 (LC4C) to J30 (LC3C). Crank the engine. **Does the light blink continuously?**	Yes ▶	GO to Step 21.
	No ▶	GO to Step 22.
STEP 21		
• **Is the voltage between J15 (LCVBAT) and J2 (IGNGNDD) more than 11 VDC?**	Yes ▶	REPLACE left coil.
	No ▶	LCVBAT bad. REPAIR harness.

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DIS Module, Harness And Coil | 2.3L DP | Test 2

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 22		
• Remove the left coil from the left coil TEE. Crank the engine. **Does the light blink continuously?**	Yes ▶ No ▶	REPLACE left coil. GO to Step 23.
STEP 23		
• **Is the resistance between J30 (LC3C) and J3 (LC3D) less than 5 ohms (key off)?**	Yes ▶ No ▶	GO to Step 24. LC3 is open. REPAIR harness.
STEP 24		
• Remove the DIS module from the output TEE and the left coil from the left coil TEE. **Is the resistance between J30 (LC3C) and the negative terminal of the battery more than 10K ohms?**	Yes ▶ No ▶	GO to Step 25. LC3 is shorted to ground. REPAIR harness.
STEP 25		
• **Is the resistance between J30 (LC3C) and J5 (VBAT) more than 10K ohms (key off)?**	Yes ▶ No ▶	REPLACE DIS module. LC3 is shorted to VBAT. REPAIR harness.
STEP 26		
• Move the lead from J28 (LC4C) to J6 (LC4D). Crank the engine. **Does the light blink continuously?**	Yes ▶ No ▶	LC4 is open. REPAIR harness. GO to Step 28.
STEP 27		
• Remove the left coil from the left coil TEE. **Crank the engine. Does the light blink continuously?**	Yes ▶ No ▶	REPLACE the left coil. GO to Step 28.
STEP 28		
• **Is the resistance between J28 (LC4C) and J6 (LC4D) less than 5 ohms (key off)?**	Yes ▶ No ▶	GO to Step 29. LC4 is open. REPAIR harness.

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DIS Module, Harness And Coil | 2.3L DP | Test 2

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 29		
• Disconnect the DIS module from the module output TEE. **Is the resistance between J28 (LC4C) and the negative terminal of the battery more than 10K (key off)?**	Yes ▶	GO to Step 30.
	No ▶	LC4 is shorted to ground. REPAIR harness.
STEP 30		
• **Is the resistance between J28 (LC4C) and J5 (VBATD) more than 10K (key off)?**	Yes ▶	REPLACE DIS module.
	No ▶	LC4 is shorted to VBAT. REPAIR harness.
STEP 31		
• **Is the resistance between J2 (IGNDD) and the negative terminal of the battery more than 5 ohms, key off?**	Yes ▶	REPAIR the ground circuit. See Figure 3.
	No ▶	GO to Step 32.
STEP 32		
• **Is the voltage between J5 (VBATD) and J2 (IGNDD) more than 11 VDC, key on?**	Yes ▶	REPLACE DIS module.
	No ▶	REPAIR harness.
STEP 33		
• **Is there continuous spark at all left plug wires engine running?**	Yes ▶	CHECK IDM circuit, GO to Section 15.
	No ▶	GO to Step 34.
STEP 34		
• Jumper J54 (DPI) to J2 (IGNDD) engine running. Repeat Step 33. **OK now?**	Yes ▶	CHECK DPI circuit, GO to Section 15.
	No ▶	REPLACE DIS Module.
STEP 35		
• **Is there continuous spark at all plug wires?**	Yes ▶	REPLACE DIS Module.
	No ▶	GO to TEST 1, Step 9.

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DIS Module, Harness And Sensor | 2.3L DP | Test 3

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 1		
◦ Remove the DIS module from the DIS input TEE. Crank the engine in very short bursts. **OK now?**	Yes ▶	REPLACE DIS module.
	No ▶	RECONNECT module. GO to Step 2.
STEP 2		
◦ **Is the voltage between J33 (CIDS) and J2 (IGNDD) 0 and + VBAT while cranking or 6.5 VDC (± 1 VDC) if engine runs?**	Yes ▶	CID is open. REPAIR harness.
	No ▶	GO to Step 3.
STEP 3		
◦ **Is the voltage between J53 (VBATS) and J2 (IGNDD) 11 to 14 VDC (key on)?**	Yes ▶	GO to Step 4.
	No ▶	VBATS bad. REPAIR harness.
STEP 4		
◦ **Is the resistance between J55 (IGNDS) and J2 (IGNDD) less than 5 ohms?**	Yes ▶	GO to Step 5.
	No ▶	IGNDS is open.
STEP 5		
◦ **Is the resistance between J51 (CIDD) and J33 (CIDS) less than 5 ohms (key off)?**	Yes ▶	GO to Step 6.
	No ▶	CID is open. REPAIR harness.
STEP 6		
◦ Disconnect the sensor from the sensor TEE. **Is the resistance between J51 (CIDD) and J2 (IGNDD) more than 10K ohms (key off)?**	Yes ▶	GO to Step 7.
	No ▶	CID is shorted to ground. REPAIR harness.
STEP 7		
◦ **Is the resistance between J51 (CIDD) and J5 (VBATD) more than 10K ohms (key off)?**	Yes ▶	REPLACE sensor.
	No ▶	CID is shorted. REPAIR harness.

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DIS Module, Harness And Sensor | 2.3L DP | Test 3

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 8		
• **Is the voltage between J35 (PIPS) and J2 (IGNDD) 0 and + VBAT while cranking the engine in very short bursts?**	Yes ▶	PIP is open. REPAIR harness.
	No ▶	GO to Step 9.
STEP 9		
• **Is the resistance between J35 (PIPS) and J32 (PIPD) less than 5 ohms (key off)?**	Yes ▶	GO to Step 10.
	No ▶	PIP is open. REPAIR harness.
STEP 10		
• Remove the DIS module from the DIS input TEE. Repeat Step 8. **OK now?**	Yes ▶	REPLACE DIS module.
	No ▶	RECONNECT module. GO to Step 11.
STEP 11		
• **Turn the key on. Is the voltage between J53 (VBATS) and J2 (IGNDD) 11 to 14 VDC?**	Yes ▶	GO to Step 13.
	No ▶	GO to Step 12.
STEP 12		
• Disconnect the sensor from the sensor TEE. Repeat Step 11. **OK now?**	Yes ▶	REPLACE sensor.
	No ▶	VBATS bad. REPAIR harness.
STEP 13		
• **Is the resistance between J55 (IGNDS) and the negative terminal of the battery less than 5 ohms (key off)?**	Yes ▶	GO to Step 14.
	No ▶	IGNDS open. REPAIR harness.
STEP 14		
• Disconnect Module from Module Input TEE and the Sensor from the Sensor TEE. • **Is the resistance between J35 (PIPS) and J5 (VBATD) more than 10K ohms key off?**	Yes ▶	GO to Step 15.
	No ▶	PIP shorted to VBAT. REPAIR harness.

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DIS Module, Harness And Sensor | 2.3L DP | Test 3

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 15		
• **Is the resistance between J35 (PIPS) and J2 (IGNDD) more than 10K ohms (key off)?**	Yes ▶	REPLACE sensor.
	No ▶	PIPS shorted to GND. REPAIR harness.
STEP 16		
• **Is Service Code 18, 28 or 48 present?**	Yes ▶	REPLACE DIS module and run Quick Test. If codes still exist, REPLACE the EEC-IV Processor.
	No ▶	GO to Section 14.
STEP 17		
• **Was a 28 or 88 service code observed during self test?**	Yes ▶	REPLACE DIS module.
	No ▶	GO to Section 14.

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IGNITION SYSTEM DIAGNOSTIC PROCEDURE (DIS) 3.0L SEFI SHO AND 3.8L SEFI SUPERCHARGED

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Index

NOTE: Start all diagnostics with Section 14 (EEC) first. The tests in this section are dependent on results from tests conducted in Section 14.

SERVICE INDEX

- If timing light will not trigger, start at TEST 1, Step 7.
- If cranking is not smooth and regular, start at TEST 1, Step 6.
- If no start and fuel O.K., start at TEST 1, Step 7.
- If no start and no fuel, start at TEST 1, Step 13.
- If continuous service code 18 (Spout fault), start at TEST 3, Step 13.
- If continuous service code 19 (CID Fault), start at TEST 1, Step 13.
- If continuous service code 45, 46 or 48 (Coil 1, Coil 2 or Coil 3 failure), lack of power and engine noise, start at TEST 2, Step 1.
- If continuous service code 49 (10 degrees spark angle all the time), start at TEST 3, Step 15.

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Preliminary Checkout, Equipment & Notes

CHECKOUT

- Visually inspect the engine compartment to ensure all vacuum hoses and spark plug wires are properly and securely connected.
- Examine all wiring harnesses and connectors for insulation damage, and burned, overheated, loose or broken conditions.
- Be certain the battery is fully charged.
- All accessories should be off during diagnosis.

EQUIPMENT

Obtain the following test equipment or an equivalent:

- DIS Diagnostic Cable (Hickok HK-100-306 or equivalent).
- Spark Tester, Neon bulb type — Champion CT-436 or equivalent.
- Spark Tester, Gap type, Special Service Tool D81P-6666-A.
- Volt/Ohm Meter Rotunda 014-00407 or equivalent.
- 12-14 Volt test lamp
- Remote Starter Switch
- Timing Light, Rotunda 059-00006 or equivalent.
- EEC-IV breakout box — Rotunda T83L-50-EEC-IV or equivalent.

EQUIPMENT (Optional)

- DIS Module Tester. Hickok Model 600 or equivalent.

This tester contains 12 leads, 12 test jacks and an interface cable. It monitors signals in and out of the DIS Module. It is hand held and self contained.

- DIS Coil/Sensor Tester. Hickok Model 601 or equivalent.

This tester is similar to the Module Tester except it monitors the coils and sensors.

NOTES

- When making measurements on a wiring harness, both a visual inspection and a continuity test should be performed.
- Spark timing adjustments cannot be made.
- When making voltage checks a ground reading means any value within a range of 0 to 1 volt. Also VBAT readings means any value that falls within a range of VBAT to 2 volts less then VBAT.
- When making voltage checks and a reference to ground is made use either the negative battery lead or cast iron on the engine. VBAT means the positive battery cable at the battery.
- When using the spark plug firing indicator, place the grooved end as close as possible to the plug boot. A fouled plug may cause weak flashing

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DIS Diagnostic Cable

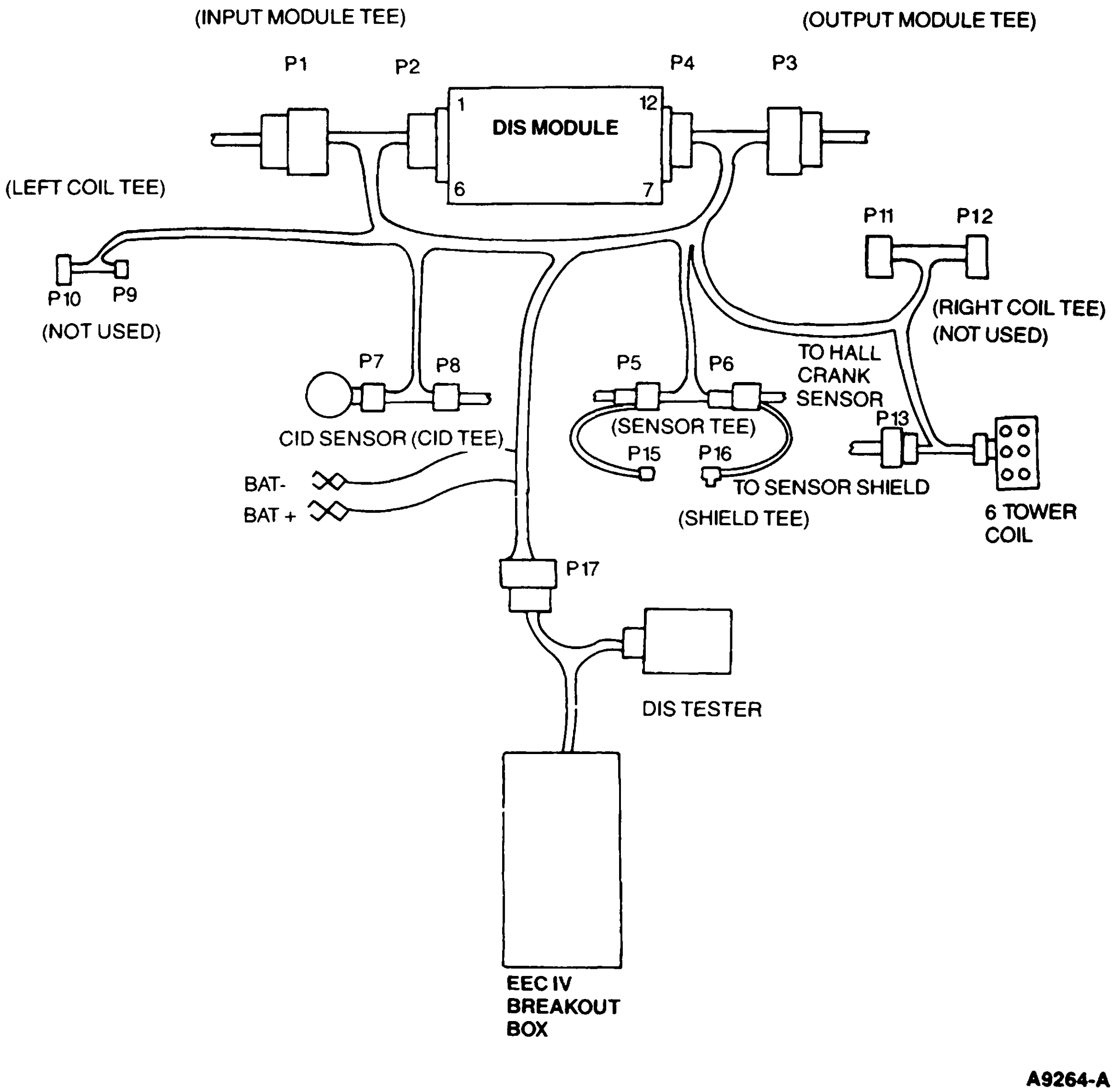

Figure 1

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DIS Module Pin-Out

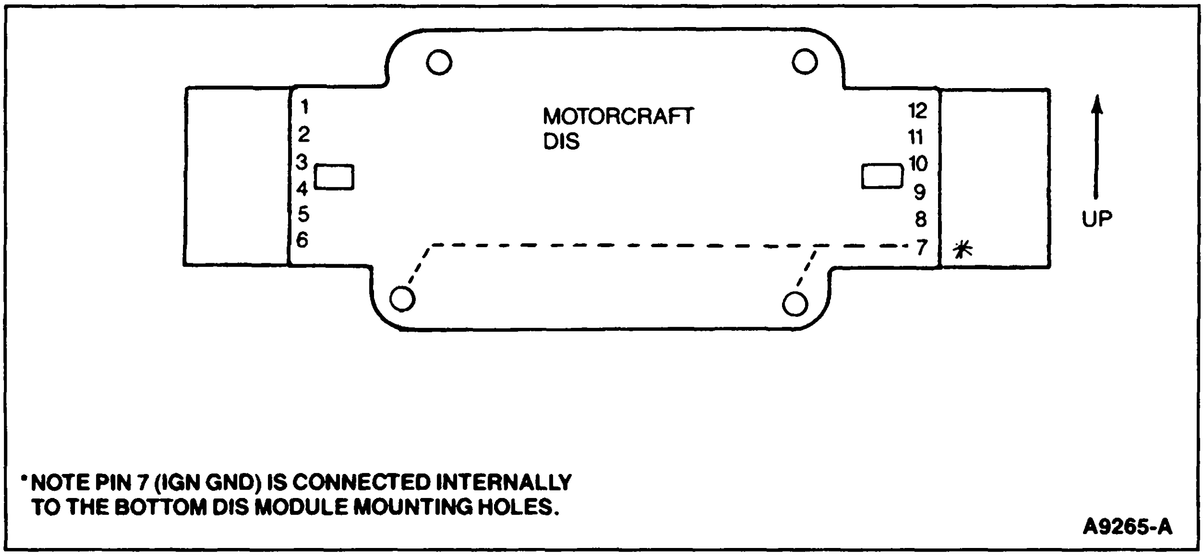

Figure 2

PIN #	
1	VBAT
2	CID
3	—
4	PIP In
5	SPOUT
6	—
7	IGND
8	COIL 1
9	COIL 3
10	—
11	COIL 2
12	IDM

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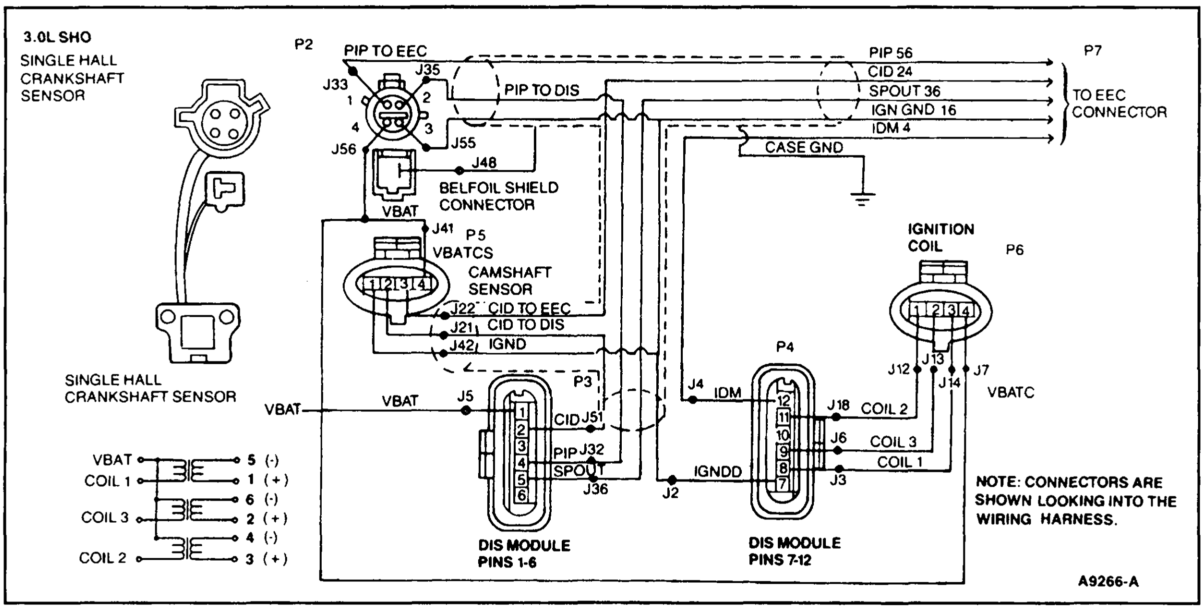
DIS Wiring Schematic



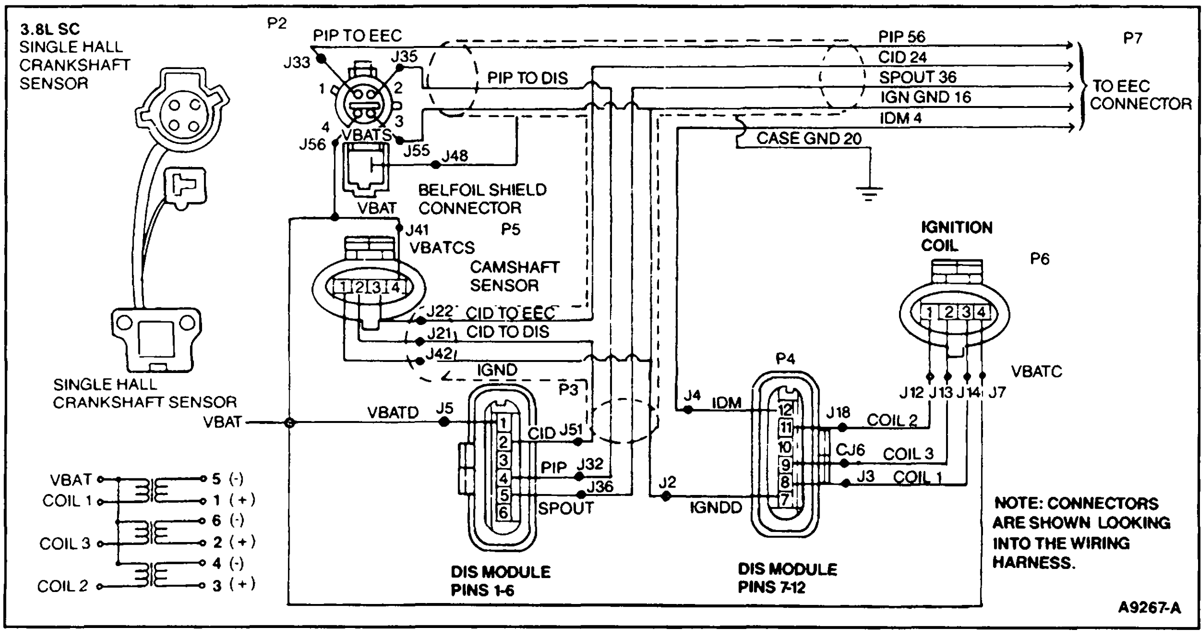


Figure 3

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Sensor Description

The cam and crank sensors used on the 3.0L SHO and 3.8L SC vehicles are digital Hall devices (Figure 4). The 3.0L SHO cam sensor is located on the right end of the rear cylinder head close to cylinder 1. In the 3.8L SC, the cam sensor is in the location normally used for the distributor. The cam sensor is the same in both cases but the mounting adaptor is different. A rotary vane cup (or wheel), made of ferrous metal (Figure 5), is used to trigger the Hall effect switch located in each of the sensors. The camshaft cup has one tooth and is driven by the camshaft damper. The signal from the camshaft sensor has one positive-going edge once every two crank revolutions (one cam revolution). The crankshaft cup has three teeth and the Crankshaft sensor generates three positive (PIP) edges every revolution of the crank shaft.

When the window of the vane cup is between the magnet and Hall effect device, a magnetic flux field is completed from the magnet through the Hall effect device and back to the magnet (Figure 5), the output signal will be low (0 volts). However, when the vane tooth moves into the gap between the Hall effect device and the magnet, the flux lines are shunted through the vane and back to the magnet (Figure 7) and the output will change from a low to high (VBAT).

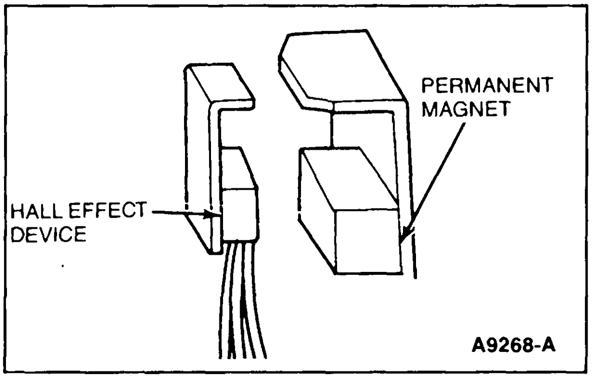

Figure 4 Hall Effect Device

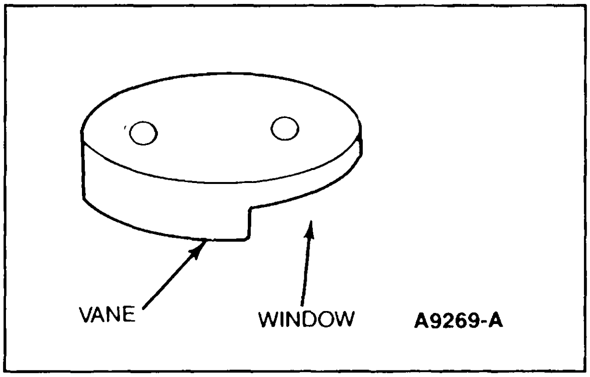

Figure 5 Rotary Vane Cup — CAM Sensor

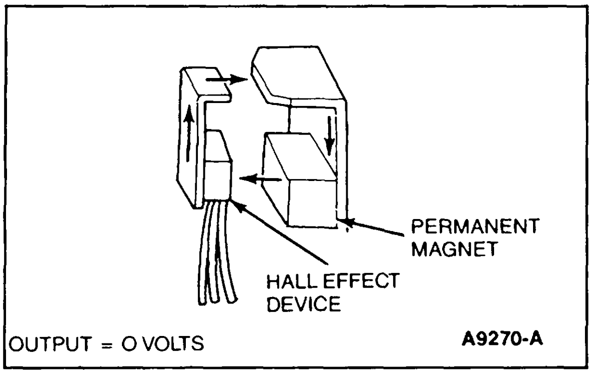

Figure 6 Magnetic Flux Field

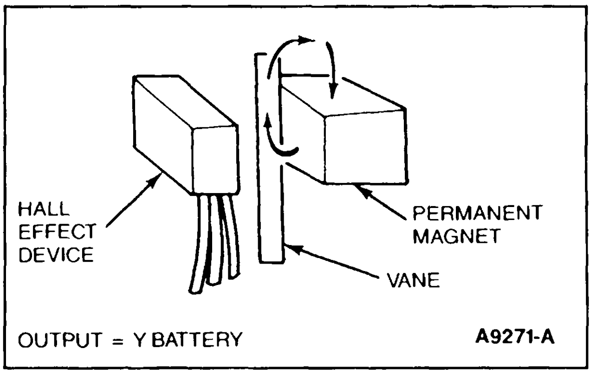

Figure 7 Hall Effect Device Response to Vane

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3.0/3.8L Dual Plug DIS System Description

The Ford DIS system (refer to Figure 8) consists of a crankshaft mounted Hall (PIP) Sensor, a camshaft driven Hall (CID) sensor, a 6 tower DIS coil, and a DIS ignition module.

The DIS ignition system eliminates the distributor by using multiple coils. Each coil fires two spark plugs at the same time. The plugs are paired so that as one fires during the compression cycle the other fires during the exhaust stroke. The next time the coil is fired the plug that was on exhaust will be on compression and the one that was on compression will be on exhaust (the spark in the exhaust cylinder is wasted but little of the coil energy is lost). Three coils are mounted together in a "coil pack", each pack has three tach wires, one for each coil. The crank sensor is a digital output Hall device (PIP) that responds to a rotating metallic vane mounted on the crankshaft damper assembly.

The 3.0L SHO DIS system CID signal is generated by a Hall device mounted at the end of the rear camshaft. The vane cup has one tooth and is driven by the camshaft. The 3.8L SC system CID sensor is a Hall device but it is mounted in the normal distributor location.

The PIP output is a 50 percent duty cycle signal that provides base spark timing information. The CID signal output is also a 50 percent duty cycle signal and is required so that the DIS module knows which coil to fire and for fuel timing in the EEC IV. CID is high (VBAT) half of the cam revolution (180 degrees) and low the other half (refer to timing diagram two pages ahead).

The EEC Module determines spark angle using the PIP signal to establish base timing. Spout is sent from the EEC module to the DIS module and serves two purposes: the leading edge fires the coil and the trailing edge controls the dwell time. This feature is called CCD or computer controlled dwell.

The Ignition Diagnostic Monitor (IDM) is an output from the DIS module that provides diagnostic information concerning the ignition system to the EEC IV module for self-test and is also the input signal for the vehicle tachometer. If the CID circuit fails and an attempt to start the engine is made, the DIS module will randomly select one of the three coils to fire, if hard starting results, turning the key off and then cranking again will result in another "guess." Several attempts may be needed until the proper coil is selected allowing the vehicle to be started and driven until repairs can be made. The Failure Effects Management system attempts to keep the vehicle driveable in spite of certain EEC system failures that prevent the EEC module from providing spark angle or dwell commands. The EEC module opens the SPOUT line and the DIS module fires the coils directly from the PIP input. This results in a fixed spark angle of 10 degrees and fixed dwell.

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DIS Block Diagram

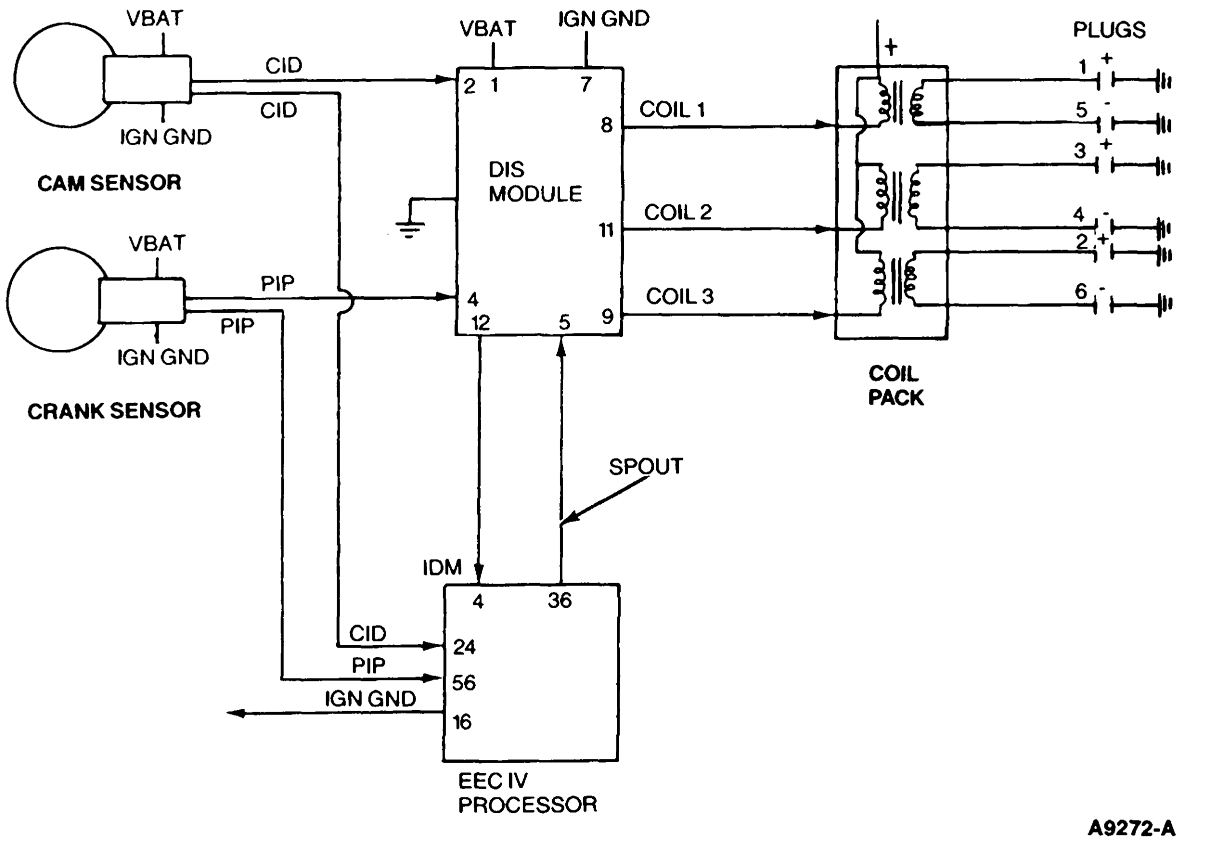

Figure 8

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DIS Waveforms

Timing Diagram

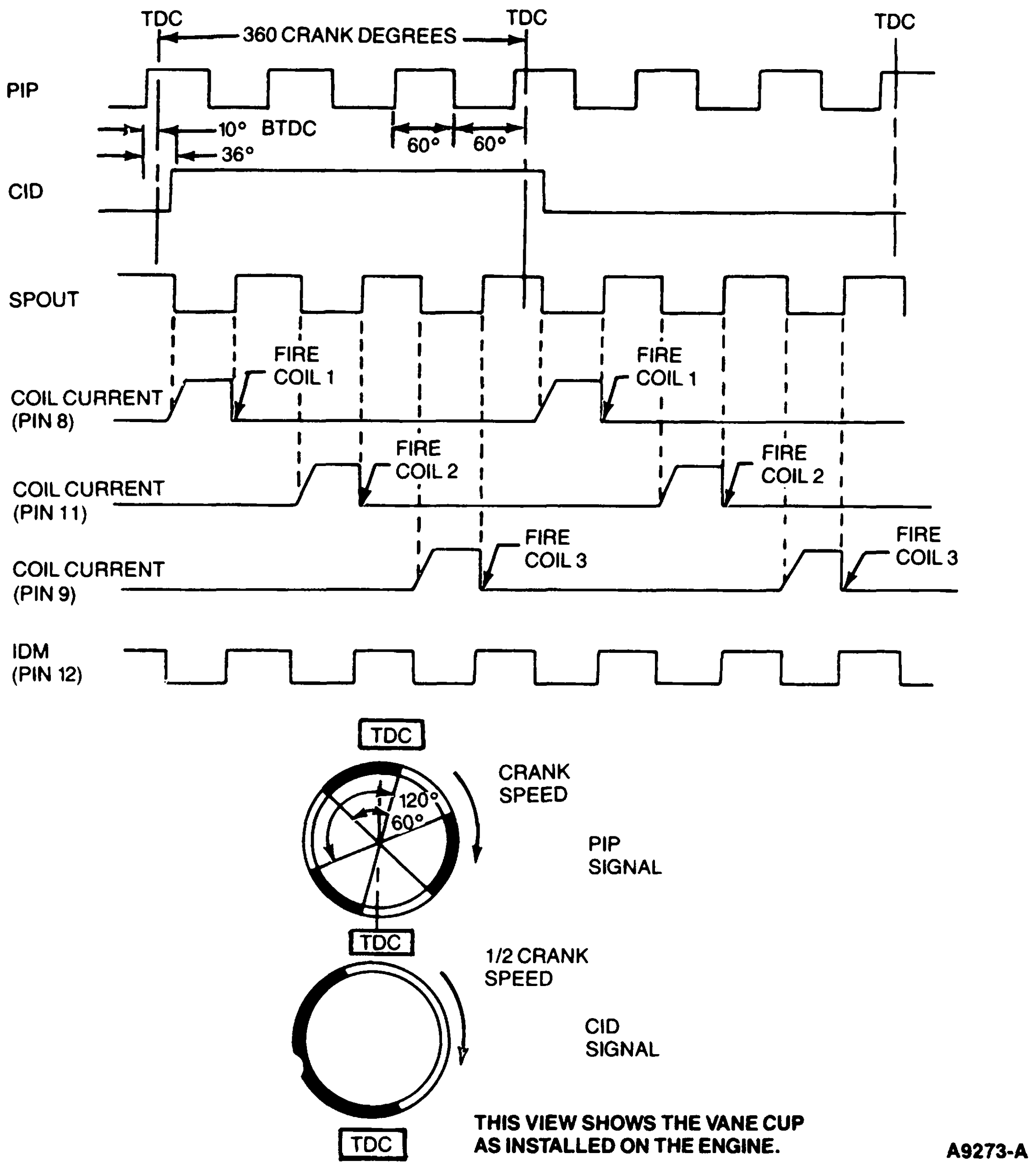

Figure 9

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3.0L SHO DIS Ignition System

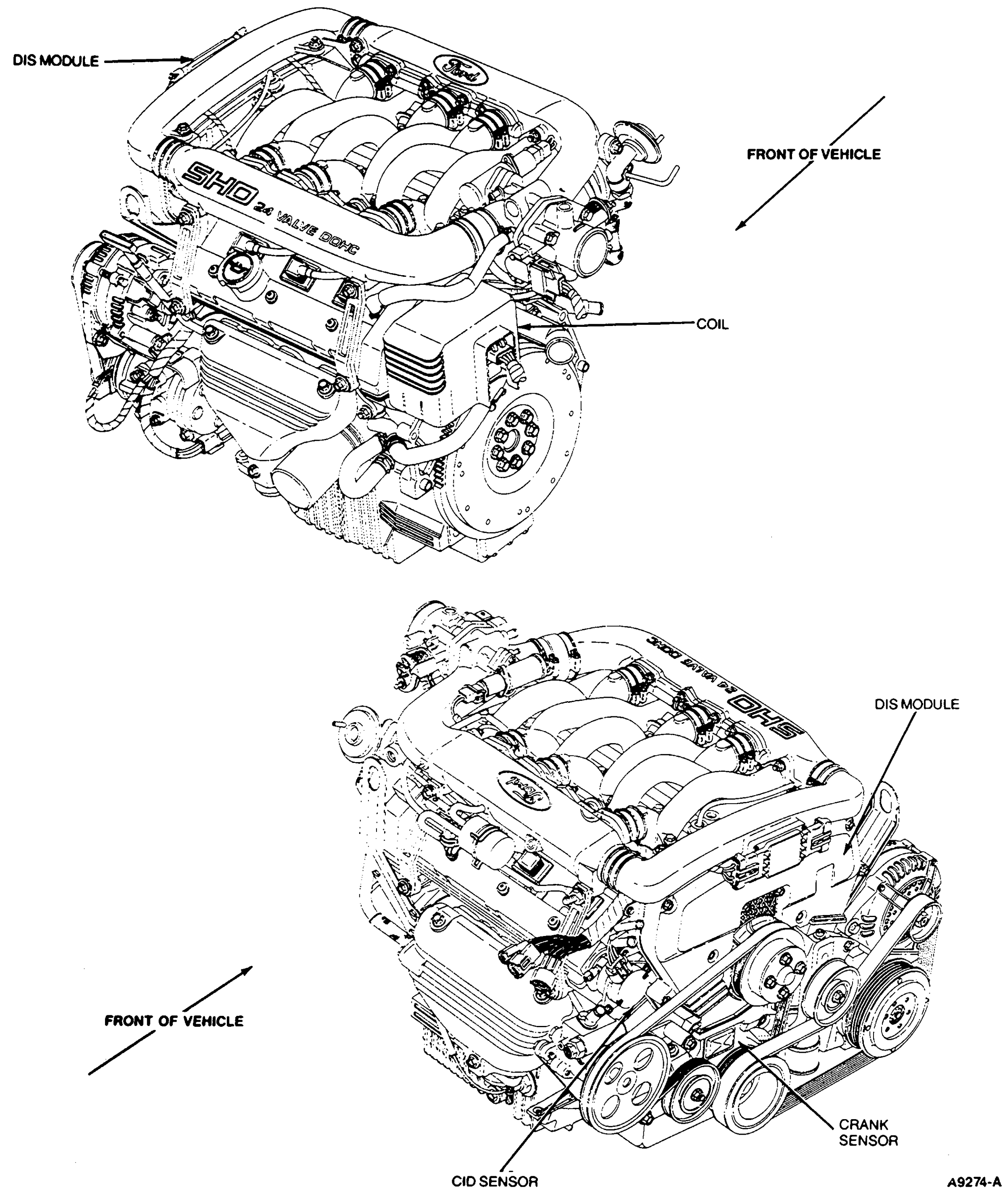

Figure 10 3.0L SHO DIS Parts Location

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3.8L SC DIS Ignition System

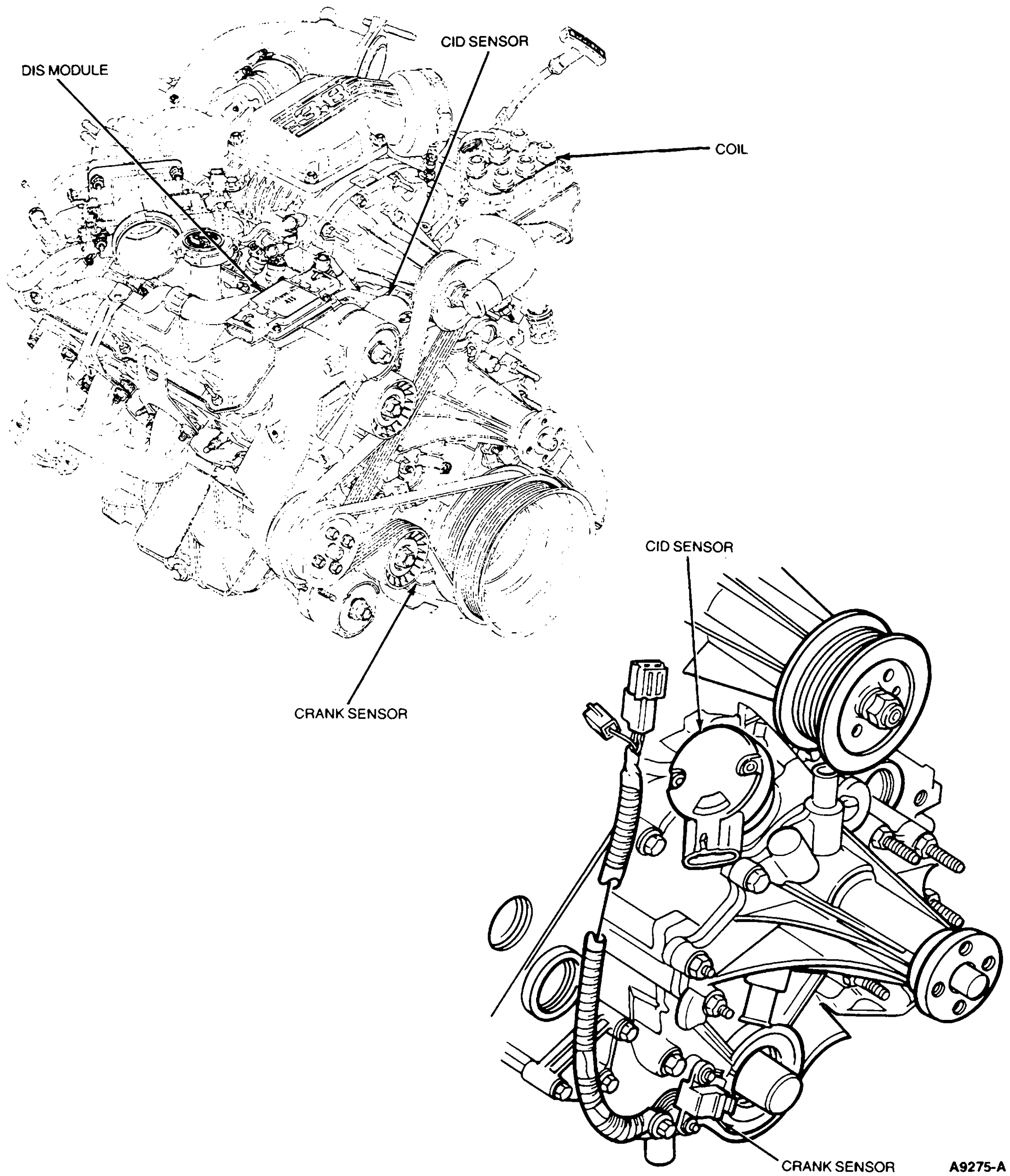

Figure 11 3.8L SC DIS Parts Location

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System Function | 3.0 SHO, 3.8 SC | Test 1

TEST STEP	RESULT	ACTION TO TAKE
STEP 1		
• **Is the spark angle 10 degrees BTDC (± 3 degrees) with the SPOUT jumper disconnected?**	Yes ▶	GO to Step 2.
	No ▶	GO to Step 3.
STEP 2		
• **Is the spark angle 30 degrees BTDC (± 3 degrees) with SPOUT jumper connected, during self test?**	Yes ▶	GO to Step 4.
	No ▶	REPLACE DIS module.
STEP 3		
• **Inspect the vane cups located on the back of the crankshaft damper (refer to Group 26). Are the cups bent or damaged?**	Yes ▶	REPLACE or REPAIR.
	No ▶	REPLACE crank sensor.
STEP 4		
• **Is cranking smooth and regular (does not backfire or pause)?**	Yes ▶	GO to Step 7.
	No ▶	GO to Step 5.
STEP 5		
• **Is there continuous spark at all plug wires (use neon spark tester)?**	Yes ▶	GO to Step 6.
	No ▶	GO to Step 8.
STEP 6		
• Install the DIS diagnostic cable and EEC breakout box. Measure the voltage between J51 (CIDD) and J2 (IGNDD) while cranking the engine in very short bursts. **Are two voltages, 0 and + VBAT observed during crank or 6.4 VDC (± 1 VDC) if engine runs?**	Yes ▶	REPLACE DIS module.
	No ▶	GO to TEST 3, Step 1.
STEP 7		
• **Is there continuous spark at all plug wires (use neon spark tester)?**	Yes ▶	GO to Step 11.
	No ▶	GO to Step 8.

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System Function

3.0 SHO, 3.8 SC | **Test 1**

TEST STEP	RESULT	ACTION TO TAKE
STEP 8		
o Using the air gap spark tester at the coil, verify that there is good quality (blue) spark at all coil towers.	Yes	GO to Test 2, Step 1.
	No	GO to Step 9.
STEP 9		
o Is the resistance of the plug wires less than 30K ohms?	Yes	GO to Step 10.
	No	REPLACE bad wires.
STEP 10		
o Inspect the plugs. Are they OK?	Yes	GO to Test 2, Step 1.
	No	REPLACE bad plugs.
STEP 11		
o Is the resistance of the plug wires less than 30K ohms?	Yes	GO to Step 12.
	No	REPLACE bad wires.
STEP 12		
o Inspect the plugs. Are they OK?	Yes	Ignition OK, GO to Section 2.
	No	REPLACE bad plugs.
STEP 13		
o Install DIS Diagnostic Cable and EEC Breakout Box. Measure the voltage between J22 (CIDEEC) and the negative terminal of the battery while cranking the engine in very short bursts. **Are two voltages 0 and VBAT observed or 6.5 (± 1 VDC) if enigne runs?**	Yes	CID Sensor OK. GO to Section 2.
	No	GO to Step 14.
STEP 14		
o Is the resistance between J42 (GNDCS) and the negative of the battery less than 5 ohms key off?	Yes	GO to Section 15.
	No	IGNDCS fault, REPAIR circuit. (Figure 2.)

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System Function | 3.0 SHO, 3.8 SC | Test 1

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 15		
• **Is the voltage between J41 (VBATC) and J55 (IGNDC) more than 11 VDC key on?**	Yes ▶	REPLACE CID Sensor.
	No ▶	GO to Step 16.
STEP 16		
• **Remove the CID Sensor from the Sensor TEE. Repeat Step 15, OK now?**	Yes ▶	REPLACE CID Sensor.
	No ▶	VBATCS fault, repair harness.
STEP 17		
• Install the DIS Diagnostic Cable and EEC Breakout Box. Measure the voltage between J33 (PIPEEC) and the negative terminal of the battery while cranking the enigne in very short bursts. **Are two voltages observed 0 and VBAT or 6.5 (± 1 VDC)?**	Yes ▶	PIP Sensor OK. GO to Section 2.
	No ▶	GO to Step 18.
STEP 18		
• **Is the resistance between J55 (IGNDC) and the negative terminal of the battery less than 5 ohms?**	Yes ▶	GO to Step 19.
	No ▶	IGNDC fault, REPAIR IGNDC circuit. (Figure 2.)
STEP 19		
• **Is the voltage between J56 (VBATC) and J55 (IGNDC) more than 11 VDC key on?**	Yes ▶	REPLACE PIP Sensor.
	No ▶	GO to Step 20.
STEP 20		
• **Remove the PIP Sensor from the Crank Sensor TEE. Repeat Step 19, OK now?**	Yes ▶	REPLACE PIP Sensor.
	No ▶	VBAT fault REPAIR harness.

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DIS Module, Harness And Coil

3.0 SHO, 3.8 SC

Test 2

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 1		
o Install the DIS diagnostic cable and EEC breakout box. o **Is there continuous spark at any coil wire?**	Yes ▶ No ▶	GO to Step 6. GO to Step 2.
STEP 2		
o **Is the voltage between J5 (VBATD) and the negative terminal of the battery more than 11 VDC with the key on?**	Yes ▶ No ▶	GO to Step 3. GO to Step 31.
STEP 3		
o **Is the resistance between J2 (IGNDD) and the negative of the battery less than 5 ohms key off?**	Yes ▶ No ▶	GO to Step 4. IGNDD open, REPAIR harness.
STEP 4		
o Measure the voltage between J32 (PIPD) and J2 (IGNDD) while cranking the engine in very short bursts. o **Are two voltage 0 and VBAT observed during crank or 6.5 VDC (± 1 VDC) if enigne runs?**	Yes ▶ No ▶	GO to Step 5. GO to Test 3, Step 8.
STEP 5		
o Measure the voltage between J51 (CIDD) and J2 (IGNDD) while cranking the engine in very burst. o **Are two voltage levels, 0 and VBAT observed during crank or 6.5 (± 1 VDC) if engine runs?**	Yes ▶ No ▶	GO to Step 6. GO to TEST 3, Step 1.
STEP 6		
o Connect the test light between J14 (C1C) if 3.0 or J12 (C1C) if 3.8 and J5 (VBATD). o **Crank the engine, does the light blink continuously?**	Yes ▶ No ▶	GO to Step 7. GO to Step 10.
STEP 7		
o Move the lead from J12 to J14 to J13 (C3C). o **Crank the engine, does the light blink continuously?**	Yes ▶ No ▶	GO to Step 8. GO to Step 15.

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DIS Module, Harness And Coil | 3.0 SHO, 3.8 SC | Test 2

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 8		
• Move the lead from J13 (C3C) to J12 (C2C) if 3.0 or J14 (C2C) if 3.8. • **Crank the engine. Does the light blink continuously?**	Yes ▶ No ▶	GO to Step 9. GO to Step 20.
STEP 9		
• **Is the voltage between J7 (VBATC) and J2 (IGNDD) more than 11 VDC?**	Yes ▶ No ▶	REPLACE coil. Coil VBAT is bad repair harness.
STEP 10		
• For 3.0L, move the lead from J14 to J3 (C1D). • For 3.8L, move the lead from J12 to J3 (C1D). • **Does the light blink continuously?**	Yes ▶ No ▶	C1C is open, REPAIR. GO to Step 11.
STEP 11		
• Remove the coil from the coil TEE. Crank the engine. Does the light blink continuously?	Yes ▶ No ▶	REPLACE the coil. GO to Step 12.
STEP 12		
• For 3.0L, measure resistance between J14 (C1C) and J3 (C1D). • For 3.8L, measure resistance between J12 (C1C) and J3 (C1D). • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to Step 13. C1 is open, REPAIR harness.
STEP 13		
• Disconnect the DIS module from the module output TEE. **Is the resistance between J18 (CID) and J2 (IGNDD) more than 10K key off?**	Yes ▶ No ▶	GO to Step 14. C1 is shorted to GND, REPAIR harness.
STEP 14		
• **Is the resistance between J18 (CID) and J5 (VBATD) more than 10K ohms key off?**	Yes ▶ No ▶	REPLACE DIS module. C1 is shorted to VBAT.

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DIS Module, Harness And Coil

3.0 SHO, 3.8 SC

Test 2

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 15		
o Move the lead from J13 (C3C) to J6 (C3D). Crank the engine. **Does the light blink continuously?**	Yes ▶	C3 is open, REPAIR harness.
	No ▶	GO to Step 16.
STEP 16		
o Remove the coil from the coil TEE. Crank the engine. **Does the light blink continuously?**	Yes ▶	REPLACE coil.
	No ▶	GO to Step 17.
STEP 17		
o **Is the resistance between J13 (C3C) and J6 (C3D) less than 5 ohms key off?**	Yes ▶	GO to Step 18.
	No ▶	C3 is open, REPAIR harness.
STEP 18		
o Disconnect the DIS module from the module output TEE. **Is the resistance between J6 (C3D) and J2 (IGNDD) more than 10K ohms Key off?**	Yes ▶	GO to Step 19.
	No ▶	C2 is shorted to GND REPAIR harness.
STEP 19		
o **Is the resistance between J13 (C3C) and J5 (VBATD) more than 10K ohms key off?**	Yes ▶	C2 is shorted to VBAT.
	No ▶	REPLACE DIS module
STEP 20		
o For 3.0L, move the lead from J12 to J18 (C2D). For 3.8L, move the lead from J14 to J18 (C2D). Crank the engine. **Does the light blink continuously?**	Yes ▶	C2 is open, REPAIR harness.
	No ▶	GO to Step 21.
STEP 21		
o Remove the coil from the coil TEE. Crank the engine. **Does the light blink continuously?**	Yes ▶	REPLACE coil.
	No ▶	GO to Step 22.

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DIS Module, Harness And Coil | 3.0 SHO, 3.8 SC | Test 2

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 22		
• For 3.0L, measure the resistance between J3 (C1D) and J14 (C1C). • For 3.8L, measure the resistance between J3 (C1D) and J12 (C1C). • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to Step 23. C1 open. REPAIR harness.
STEP 23		
• Disconnect the module from the module output TEE. **Is the resistance between J3 (C1D) and J2 (IGNDD) more than 10K ohms key off?**	Yes ▶ No ▶	GO to step 24. C1 is shorted to GND. REPAIR harness.
STEP 24		
• **Is the resistance between J3 (C1D) and J5 (VBATD) more than 10K ohms key off?**	Yes ▶ No ▶	REPLACE DIS module. C1 is shorted to VBAT. REPAIR harness.

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DIS Module, Harness And Sensors | 3.0 SHO, 3.8 SC | Test 3

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 1		
o Disconnect the module from the DIS input TEE. Measure the voltage between J51 (CIDD) and J2 (IGNDD), while cranking the engine in very short bursts. **Are two voltages 0 and +VBAT observed during crank or 6.5 (± 1 VDC) if the engine runs?**	Yes ▶	REPLACE DIS module.
	No ▶	GO to Step 2.
STEP 2		
o **Is the voltage between J21 (CIDS) and J2 0 and +VBAT while cranking or 6.5 VDC (± 1 VDC) if the engine runs?**	Yes ▶	CID is open. REPAIR harness.
	No ▶	GO to Step 3.
STEP 3		
o **Is the voltage between J41 (VBATCS) and J2 (IGNDD) more than 11 VDC key on?**	Yes ▶	GO to Step 4.
	No ▶	VBATCS fault. REPAIR harness.
STEP 4		
o **Is the resistance between J42 (IGNDCS) and J2 (IGNDD) less than 5 ohms, key off?**	Yes ▶	GO to Step 5.
	No ▶	IGND is open. REPAIR IGND circuit. (Figure 3.)
STEP 5		
o **Is the resistance between J21 (CIDS) and J51 (CIDD) less than 5 ohms?**	Yes ▶	GO to Step 6.
	No ▶	CID is open. REPAIR harness
STEP 6		
o Disconnect the CID sensor from the CID TEE. o **Is the resistance between J51 (CIDD) and J2 (IGNDD) more than 10K ohms key off?**	Yes ▶	GO to Step 7.
	No ▶	CID is shorted to GND, REPAIR harness.

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DIS Module, Harness And Sensors | 3.0 SHO, 3.8 SC | Test 3

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 7		
• **Is the resistance between J51 and J5 (VBATD) more than 10K ohms key off?**	Yes ▶	REPLACE CID sensor.
	No ▶	CID is shorted to VBAT
STEP 8		
• **Is the voltage between J35 (PIPS) and J2 (IGNDD) 0 and +VBAT while cranking the engine in very short bursts?**	Yes ▶	PIP is open. REPAIR harness.
	No ▶	GO to Step 9.
STEP 9		
• **Is the resistance between J35 (PIPS) and J32 (PIPD) less than 5 ohms key off?**	Yes ▶	GO to Step 10.
	No ▶	PIP is open. REPAIR harness.
STEP 10		
• Disconnect the DIS module from the DIS input TEE. Repeat Step 8. **OK now?**	Yes ▶	REPLACE DIS module.
	No ▶	GO to Step 11.
STEP 11		
• **Is the voltage between J56 (VBATS) and J2 (IGNDD) more than 11 VDC, with the key on?**	Yes ▶	GO to Step 12.
	No ▶	GO to Step 13.
STEP 12		
• **Is the resistance between J55 (IGNDPS) and the negative terminal of the battery less than 5 ohms key off?**	Yes ▶	GO to Step 13.
	No ▶	REPAIR harness.
STEP 13		
• Disconnect the crank sensor from the crank sensor TEE. Repeat Step 11. **OK now?**	Yes ▶	REPLACE crank sensor.
	No ▶	VBAT to crank sensor bad. REPAIR harness.

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DIS Module, Harness And Sensors | 3.0 SHO, 3.8 SC | Test 3

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 14		
• **Was a continuous service code of 18 observed during self test?**	Yes ▶	REPLACE DIS Module.
	No ▶	RETURN to Section 14.
STEP 15		
• **Is SPOUT continuous Code 18 or 49 present?**	Yes ▶	REPLACE DIS module.
	No ▶	GO to Section 14.

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ENGINE/EMISSIONS DIAGNOSIS

Contents

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HOW TO USE QUICK TEST

SPECIAL NOTES:

- START with Section 14, EEC-IV Quick Test Procedures and Appendix when directed here by Section 2, Diagnostic Routines.
- Sections 15 and 16, Engine Supplement Sections for Passenger Car and Truck, contain EEC-IV system electrical schematics, circuit numbers, wire colors, pin usage applications and Quick Test code definitions.
- Section 17 contains the EEC-IV Pinpoint Tests.
- Refer to Sections 1 and 3 to identify the emission components on your vehicle.
- An open is defined as any resistance reading greater than 5 ohms unless otherwise specified.
- A short is defined as any resistance reading less than 10,000 ohms to ground, unless otherwise specified.
- Quick Test results are dependent on the proper operation of base engine components. It may be necessary to correct any defects in these areas before the EEC-IV system will pass Quick Test. (Refer to Section 2, Diagnostic Routines, for service).
- When more than one service code is received, always start service with the first code received.
- Before using a Pinpoint Test always read the information on the cover page(s) (i.e. Notes, Remember and Pinpoint Test Schematic).
- When using a Pinpoint Test, follow each step in order. After completion, verify that all components are properly reconnected and rerun Quick Test or verify that the drive complaint has been eliminated.
- "RERUN Quick Test" means return to Section 14 and run Quick Test Steps 1.0 thru 7.0.

The standard Ford color abbreviations are:

BK	**Black**	**N**	**Natural**
BL	**Blue**	**O**	**Orange**
BR	**Brown**	**PK**	**Pink**
DB	**Dark Blue**	**P**	**Purple**
DG	**Dark Green**	**R**	**Red**
GY	**Gray**	**T**	**Tan**
GR	**Green**	**W**	**White**
LB	**Light Blue**	**Y**	**Yellow**
LG	**Light Green**		

Where two colors are shown for a wire, the first color is the basic color of the wire. The second color is the stripe marking.

For example:

BR/O is a brown wire with an orange stripe.

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HOW TO USE QUICK TEST

DO

- Turn the key off and isolate both ends of a circuit whenever checking for shorts or continuity.
- Disconnect solenoids and switches from the harness before measuring for continuity, resistance or energizing by way of a 12 volt source.
- When disconnecting connectors, inspect for damaged or pushed-out pins, corrosion, loose wires, etc. Service as necessary.

DON'T

- Go to the Pinpoint Test Section unless directed by the Quick Test procedures. (Not following Quick Test procedures may produce incorrect results and replacement of non-defective components.)
- Replace any parts unless directed by a test procedure.
- Measure voltage or resistance directly at the processor connector.

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SECTION 14

EEC-IV — Quick Test — All Engines

Contents

(Continued)

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SECTION 14

EEC-IV — Quick Test — All Engines

Contents

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QUICK TEST: Test Description

SPECIAL NOTES:

- This diagnostic procedure is used **ONLY** on vehicles equipped with fourth generation Electronic Engine Controls (EEC-IV).
- The QUICK TEST procedure should be used **ONLY** when the Diagnostic Routines, Section 2 direct you here.
- If all phases of the Quick Test, including Diagnostic By Symptom in Quick Test Step 7.0, result in a PASS, it is likely that the problem is non-EEC-IV related and will be found elsewhere. You should return to the Diagnostic Routines in Section 2.
- When directed to a Pinpoint Test always read the cover page(s) for special notes and look carefully at the Pinpoint Test Schematic.
- After service, Steps 3.0, 5.0, and 6.0 should be repeated to ensure that service was effective.

QUICK TEST STEPS

1. Visual Check and Vehicle Preparation
2. Equipment Hookup
3. Key On Engine Off Self-Test
4. Computed Timing Check
5. Engine Running Self-Test
6. Continuous Self-Test
7. Diagnostic by Symptom

The Key On Engine Off and Engine Running Self-Tests detect faults that are present at the time of testing. Intermittent faults that have occurred in the last 40 warm-up cycles are detected during Continuous Self-Test and stored in the EEC-IV memory.

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QUICK TEST: Visual Check Vehicle Preparation

1.0

SPECIAL NOTES:

- Correct results of the QUICK TEST are dependent on the proper operation of related non-EEC-IV components.
- It may be necessary to disconnect or disassemble harness connector assemblies to do some of the inspections. Pin locations should be noted before disassembly.
- If the engine will not start, starts but stalls, idles rough, or runs rough; continue through QUICK TEST STEP 3.0 and follow the instructions in Step 3.0B.

VISUAL CHECK

1. Inspect the air cleaner and inlet ducting.
2. Check all engine vacuum hoses for damage, leaks, cracks, blockage, proper routing, etc.
3. Check EEC-IV system wiring harness for proper connections, bent or broken pins, corrosion, loose wires, proper routing, etc.
4. Check the processor, sensors and actuators for physical damage.
5. Check the engine coolant for proper level.
6. Check the transmission fluid level and quality.
7. Make all necessary repairs before continuing with QUICK TEST.

VEHICLE PREPARATION

1. Perform **ALL** safety steps required to start and run vehicle tests - apply parking brake, place shift lever firmly into PARK position (NEUTRAL on manual transmission), block drive wheels, etc.
2. Turn off **ALL** electrical loads — radios, lights, A/C-heater blower fans, etc.
3. Start engine and run until at operating temperature.
4. Turn engine off and proceed to QUICK TEST STEP 2.0.

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QUICK TEST: Equipment Hookup

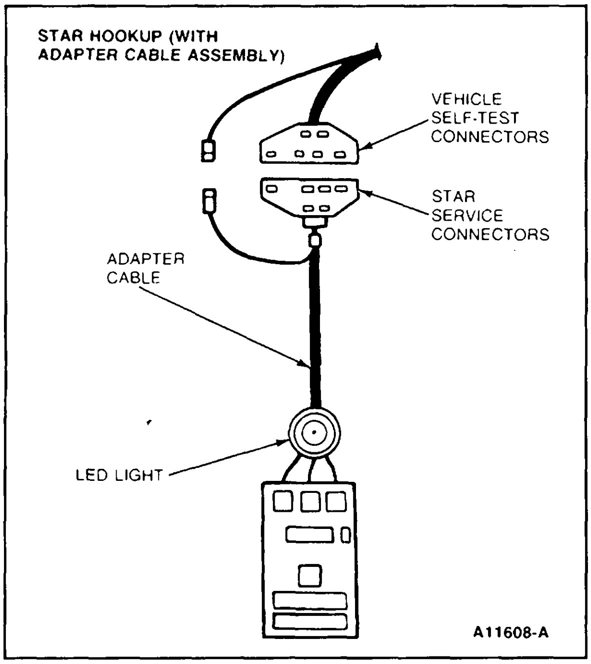
2.0

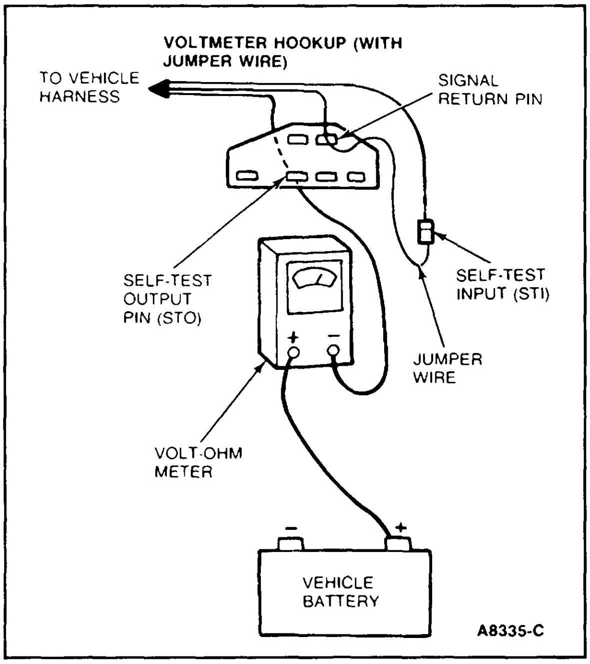
SPECIAL NOTES:

- Refer to the illustrations for Self-Test connector pin orientation and VOM and STAR hookup.
- After the equipment is properly hooked up, proceed to QUICK TEST STEP 3.0A.

USING THE STAR TESTER

1. Turn the ignition key off.
2. Connect the color coded adapter cable to the STAR tester.
3. Connect the adapter cable leads to the proper Self-Test connectors.
4. Connect the timing light.





USING AN ANALOG VOLT/OHM METER (VOM)

1. Turn the ignition key off.
2. Set the VOM on a DC voltage range to read from 0 to 15 volts.
3. Connect the VOM from the Battery + terminal to the Self-Test Output pin of the large Self-Test connector.
4. Connect the timing light.

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QUICK TEST: Equipment Hookup

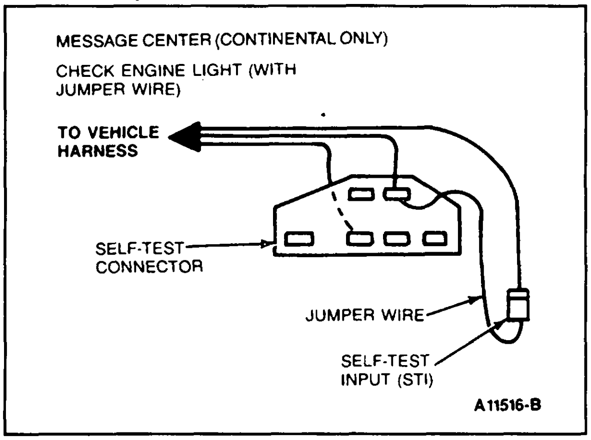
2.0

USING THE "CHECK ENGINE" LIGHT (MIL)

No special equipment hookup is required.

USING THE MESSAGE CENTER ON CONTINENTAL APPLICATIONS ONLY

No special equipment hookup is required.



USING THE OVERDRIVE CANCEL INDICATOR LIGHT (OCIL)/TRANSMISSION MALFUNCTION INDICATOR LIGHT (TMIL) ON 7.3L DIESEL ENGINES ONLY

No special equipment hookup is required.

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QUICK TEST: Key On Engine Off Self-Test

3.0

A	PERFORMING THE KEY ON ENGINE OFF SELF-TEST

SPECIAL NOTES:

- It may be necessary to service non-EEC-IV faults before running Quick Test. Refer to Section 2.
- Continuous Memory Codes recorded in this step will be used for diagnosis in Step 6.0 after a PASS code 11 is received in both the Key On Engine Off and the Engine Running Self-Tests.
- Deviation from this procedure may cause the output of false codes.
- Refer to Quick Test Appendix for further information on how to read code output.
- On all vehicles equipped with a **2.5L or 4.9L ENGINE**, the clutch must be depressed during the Key On Engine Off Self-Test.
- On all vehicles equipped with a **7.3L DIESEL ENGINE**, the throttle must be depressed (WOT) during the entire Key On Engine Off Self-Test.

HOW TO RUN THE KEY ON ENGINE OFF SELF-TEST

DO

- Verify that the vehicle has been properly prepared according to **QUICK TEST STEPS** 1.0 and 2.0.
- Place ignition key in the ON position.
- For 7.3L Diesel vehicles only, depress the throttle.
- Activate Self-Test.
  - — STAR Tester: Latch the center button in the down position.
  - — Analog VOM: Jumper STI to SIG RTN at the Self-Test connectors.
  - — "Check Engine" Light (MIL): Jumper STI to SIG RTN at the Self-Test connectors. Service Codes will be flashed on the "Check Engine" Light.
  - — Message Center (Continental Applications Only): Refer to Appendix: Self-Test.
- Record all service codes displayed.
- Go to part **B** of Key On Engine Off Self-Test.

DON'T

- Depress throttle during Key On Engine Off Self-Test on gasoline engine applications.
- Activate Self-Test before turning key to ON position.

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QUICK TEST: Key On Engine Off Self-Test

3.0

B	CODE OUTPUT		
Key On Engine Off	**Separator**	**Continuous Memory**	**ACTION TO TAKE**
11	— 1(0) —	11	o Both tests indicate a PASS. — **If engine idles rough or runs rough, Go to Pinpoint Test Step S2.** If this symptom is not present, Go to QUICK TEST STEP 4.0 (except for 7.3L Diesel, Go to Quick Test Step 5.0). — If engine is a no start, Go directly to Pinpoint Test Step A1.
ANY CODE(S)	— 1(0) —	11	o Key On Engine Off Self-Test indicates a FAULT. — Go to part **C** of Key On Engine Off Self-Test. — **Always start with the first code displayed.**
11	— 1(0) —	ANY CODE(S) EXCEPT 15, 19, 28, 45, 46, 48, 49, 50, 56, 62, 66, 67, 69, 88 or 99	o Continuous Memory indicates a FAULT. — DO NOT SERVICE CONTINUOUS MEMORY CODES AT THIS TIME. — If engine idles rough or runs rough, Go to Pinpoint Test Step S2. If this symptom is not present, Go to QUICK TEST STEP 4.0. — REFER TO CODE OUTPUT listed on next page for appropriate vehicle application and direction.
ANY CODE(S)	— 1(0) —	ANY CODE(S)	o Both tests indicate a FAULT. — DO NOT SERVICE CONTINUOUS MEMORY CODES AT THIS TIME. — Go to part **C** of Key On Engine Off Self-Test. — **Always start with the first code displayed.**
11	— 1(0) —	15	o Go To Pinpoint Test Step **QB1**.

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QUICK TEST: Key On Engine Off Self-Test

3.0

B	CODE OUTPUT		
Key On Engine Off	**Separator**	**Continuous Memory**	**ACTION TO TAKE**
			• 5.0L MA, 3.0L SHO, 3.8L SC:
11 —	10 —	56	— Go to DC10
11 —	10 —	66	— Go to DC4
			• 2.3L EFI TK:
11 —	10 —	28, 48	— Go to N3
11 —	10 —	88	— Go to N20
			• 3.0L SHO, 3.8L SC:
11 —	10 —	19	— Go to N10
11 —	10 —	45, 46, 48	— Go to N13
			• Vehicles with E4OD Transmissions:
11 —	10 —	49, 56, 59, 62, 66, 67, 69, 99	— Go to TC90
			• For all other vehicles:
11 —	10 —	67	— GO to FA1
NO CODES OUTPUTTED CODES NOT LISTED			• Self-Test did not activate or unlisted codes displayed — Repeat Key On Engine Off Self-Test to verify the above condition. — If condition still exists, Go to Pinpoint Test Step QA1 . — If engine is a no start, Go directly to Pinpoint Test Step A1 .

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QUICK TEST: Key On Engine Off Self-Test

3.0

C PASSENGER CAR SERVICE CODE CHART

Key On Engine Off Service Code	Pinpoint Test Step Direction												
	1.9L EFI	1.9L CFI	2.3L OHC EFI	2.3L TC EFI	2.3L HSC EFI	2.5L CFI	3.0L EFI	3.0L SHO SEFI	3.8L AXOD SEFI	3.8L RWD SEFI	3.8L SC SEFI	5.0L SEFI	5.0L MA SEFI
13 GO to ▶	—	KB1	—	—	—	KB1	—	—	—	—	—	—	—
15 GO to ▶	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3
19 GO to ▶	—	—	QD5	—	QD5	—	QD5	QD5	QD5	QD5	QD5	QD5	QD5
21 GO to ▶	DE1	DE1	DE1	DE1	DE1	DE1	DE1	DE1	DE1	DE1	DE1	DE1	DE1
22 GO to ▶	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1
23 GO to ▶	DH1	KB12	DH1	DH1	DH1	KB12	DH1	DH1	DH1	DH1	DH1	DH1	DH1
24 GO to ▶	—	DB1	DB1	DA1	DB1	DB1	DB1	DB1	DB1	DB1	DB1	DB1	DB1
26 GO to ▶	DK1	—	—	DK1	—	—	—	DC2	—	—	DC2	—	DC1
28 GO to ▶	DA1	—	—	DA1	—	—	—	—	—	—	—	—	—
31 GO to ▶	—	DL1	DD2	—	DL1	DN1	DL1	DL1	DL1	DL1	DL1	DN1	DN1
32 GO to ▶	—	—	—	—	—	DN25	—	—	—	—	—	DN25	DN25
34 GO to ▶	—	DL8	—	—	DL8	DN20	DL8	DL8	DL8	DL8	DL8	DN20	DN20
35 GO to ▶	—	DL5	—	—	DL5	DN5	DL5	DL5	DL5	DL5	DL5	DN5	DN5
51 GO to ▶	DE10	DE10	DE10	DE10	DE10	DE10	DE10	DE10	DE10	DE10	DE10	DE10	DE10
52 GO to ▶	—	—	FF1	—	FF1	FF1	FF1	FF1	FF1	—	—	—	—
53 GO to ▶	DH3	KB15	DH3	DH3	DH3	KB15	DH3	DH3	DH3	DH3	DH3	DH3	DH3
54 GO to ▶	—	DB10	DB10	DA10	DB10	DB10	DB10	DB10	DB10	DB10	DB10	DB10	DB10
56 GO to ▶	DK10	—	—	DK10	—	—	—	DC10	—	—	DC10	—	DC10
58 GO to ▶	DA10	KB5	—	DA10	—	KB5	—	—	—	—	—	—	—
59 GO to ▶	—	—	—	—	—	—	—	X95	T70	—	—	—	—
61 GO to ▶	DE20	DE20	DE20	DE20	DE20	DE20	DE20	DE20	DE20	DE20	DE20	DE20	DE20
62 GO to ▶	—	—	—	—	—	—	T60	—	—	—	—	—	—
63 GO to ▶	DH10	KB18	DH10	DH10	DH10	KB18	DH10	DH10	DH10	DH10	DH10	DH10	DH10
64 GO to ▶	—	DB20	DB20	DA20	DB20	DB20	DB20	DB20	DB20	DB20	DB20	DB20	DB20
66 GO to ▶	DK20	—	—	DK20	—	—	—	DC4	—	—	DC4	—	DC6
67 GO to ▶	FA1	FA1	FA1	FA1	FA1	FA1	T80	FA1	T81	FA1	FA1	FA1	FA1
68 GO to ▶	DA20	KB9	—	—	—	KB9	—	—	T90	—	—	—	—
69 GO to ▶	—	—	—	—	—	—	—	—	T75	—	—	—	—
73 GO to ▶	—	KB22	—	—	—	KB22	—	—	—	—	—	—	—
79 GO to ▶	—	—	—	—	—	—	—	FA9	FA9	FA9	FA9	FA9	FA9
81 GO to ▶	—	—	—	—	—	—	—	KT	—	—	—	KC8	KC8
82 GO to ▶	—	—	—	—	—	—	—	—	—	—	KS1	KC8	KC8
83 GO to ▶	—	—	DD17	—	—	X30	X30	X15	X30	—	X30	—	—
84 GO to ▶	—	DL11	DD17	—	DL11	DN10	DL11	DL11	DL11	DL11	DL11	DN10	DN10
85 GO to ▶	—	KD6	—	—	KD6	KD6	KD6	KD6	KD6	KD6	KD6	KD6	KD6
87 GO to ▶	—	J7	J7	—	J7	X15	X15	X15	X15	J7	J7	J7	J7
88 GO to ▶	—	—	—	—	—	X80	X80	X80	X80	—	X80	—	—
89 GO to ▶	—	—	TB1	—	—	—	T50	—	T50	—	—	—	—
93 GO to ▶	—	KB11	—	—	—	KB11	—	—	—	—	—	—	—
95 GO to ▶	J20	J20	—	—	J20	X90	X90	X90	X90	J20	J20	—	J20
96 GO to ▶	J6	J30	—	—	J30	X95	X95	X95	X95	J30	J30	—	J30
NO CODES ▶ CODES NOT LISTED ▶	Go to Pinpoint Test Step QA1												

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QUICK TEST: Key On Engine Off Self-Test

3.0

C LIGHT TRUCK SERVICE CODE CHART

Key On Engine Off Service Code	Pinpoint Test Step Direction							
	2.3L EFI	2.9L EFI	3.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
15 GO to ▶	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3
19 GO to ▶	QD1	QD1	QD1	QD1	QD1	QD1	QD1	QD1
21 GO to ▶	DE1	DE1	DE1	DE1	DE1	DE1	—	DE1
22 GO to ▶	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1
23 GO to ▶	DH1	DH1	DH1	DH1	DH1	DH1	DQ1	DH1
24 GO to ▶	DB1	DB1	DB1	DB1	DB1	DB1	—	DB1
26 GO to ▶	—	—	—	—	—	TC30	TC30	TC30
31 GO to ▶	DN1	—	—	DN1	DN1	DN1	—	DN1
32 GO to ▶	DN25	—	—	DN25	DN25	DN25	—	DN25
34 GO to ▶	DN20	—	—	DN20	DN20	DN20	—	DN20
35 GO to ▶	DN5	—	—	DN5	DN5	DN5	—	DN5
47 GO to ▶	—	—	—	—	—	TC10	TC10	TC10
51 GO to ▶	DE10	DE10	DE10	DE10	DE10	DE10	—	DE10
52 GO to ▶	FF1	—	FF1	FF1	FF1	—	—	—
53 GO to ▶	DH3	DH3	DH3	DH3	DH3	DH3	DQ2	DH3
54 GO to ▶	DB10	DB10	DB10	DB10	DB10	DB10	—	DB10
56 GO to ▶	—	—	—	—	—	TC40	TC40	TC40
61 GO to ▶	DE20	DE20	DE20	DE20	DE20	DE20	—	DE20
63 GO to ▶	DH10	DH10	DH10	DH10	DH10	DH10	DQ10	DH10
64 GO to ▶	DB20	DB20	DB20	DB20	DB20	DB20	—	DB20
66 GO to ▶	—	—	—	—	—	TC50	TC50	TC50
67 GO to ▶	FA1	FA1	FA1	FA1	FA1	FA1	FA9	FA1
81 GO to ▶	—	—	—	KC8	KC8	KC8	—	—
82 GO to ▶	—	—	—	KC8	KC8	KC8	—	KC8
84 GO to ▶	DN10	—	—	DN10	DN10	DN10	—	DN10
85 GO to ▶	—	—	KD6	KD6	—	KD6	—	KD6
86 GO to ▶	TB1	TB1	TB1	—	—	—	—	—
87 GO to ▶	J7	J7	J7	J7	J7	J7	—	J7
89 GO to ▶	TB1	TB1	TB1	—	—	—	—	—
91 GO to ▶	—	—	—	—	—	TC17	TC17	TC17
92 GO to ▶	—	—	—	—	—	TC17	TC17	TC17
93 GO to ▶	—	—	—	—	—	TC17	TC17	TC17
94 GO to ▶	—	—	—	—	—	TC17	TC17	TC17
95 GO to ▶	J20	J20	J20	J20	J20	J20	—	J20
96 GO to ▶	J30	J30	J30	J30	J30	J30	—	J30
97 GO to ▶	—	—	—	—	—	TC10	TC10	TC10
98 GO to ▶	—	—	—	—	—	TC17	TC17	TC17
99 GO to ▶	—	—	—	—	—	TC17	TC17	TC17
NO CODES ▶ CODES NOT LISTED ▶	Go To Pinpoint Test Step QA1							

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QUICK TEST: Computed Timing Check

4.0

SPECIAL NOTES:

- This Test Step does not apply to 7.3L Diesel.
- If engine is a NO START, go directly to Pinpoint Test Step A1.
- If engine starts but stalls, or stalls during timing check Go to Pinpoint Test Step S1.
- If the "Check Engine" Light (MIL) is on, do not run Quick Test timing check. Verify Key On Engine Off Self-Test is a PASS.
- Self-Test timing is equal to Base Timing plus 20 degrees BTDC ± 3 degrees (see VECI decal for correct base timing).

Example

If base timing is 10 degrees BTDC, Self-Test timing is equal to: 10 degrees + 20 degrees = 30 degrees BTDC ± 3 degrees (27 to 33 degrees BTDC).

HOW TO RUN QUICK TEST TIMING CHECK

1. Turn the key off and wait 10 seconds.
2. Start engine.
3. Activate Engine Running Self-Test.
4. Check timing after the last service code has been displayed. The timing will remain fixed for two minutes, unless Self-Test is deactivated.

Is Self-Test Timing within specification?

YES — Go To QUICK TEST STEP 5.0.

NO — Go To Pinpoint Test Step P1.

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QUICK TEST: Engine Running Self-Test

5.0

A	PERFORMING THE ENGINE RUNNING SELF TEST

SPECIAL NOTES:

- If the engine starts but stalls, or stalls during Self-Test, Go to Pinpoint Test Step S1 .
- On vehicles equipped with the Brake On/Off Switch (BOO), the brake pedal MUST be depressed and released AFTER the ID code.
- On vehicles equipped with the Power Steering Pressure Switch (PSPS), within 1 to 2 seconds after the ID code, the steering wheel must be turned at least one-half turn and released.
- On vehicles equipped with E4OD transmission, the Overdrive Cancel Switch (OCS) must be cycled after the ID code.
- The Dynamic Response code is a single pulse (or a 10 code on the STAR Tester) that occurs 6-20 seconds after the engine running identification code. (See APPENDIX: Code Output Format.)
- When the Dynamic Response code occurs, perform a brief wide-open throttle.

HOW TO RUN THE ENGINE RUNNING SELF-TEST

DO

- Deactivate Self-Test.
- Start and run engine at 2,000 rpm for two minutes. This action warms up the EGO sensor.
- Turn engine off, wait 10 seconds.
- Start engine.
- Activate Self-Test according to Quick Test Step 3.0 A.
- After the ID code, depress and release the brake pedal if appropriate. See Special Note above.
- After the ID code, within 1 to 2 seconds, turn the steering wheel at least one-half turn and then release it, if appropriate. See Special Note above.
- If a dynamic response code occurs, perform a brief wide-open throttle (WOT).
- Record all service codes displayed.
- Go to part **B** of Engine Running Self-Test.

DON'T

- Depress the throttle unless a Dynamic Response Code is displayed.

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QUICK TEST: Engine Running Self-Test

5.0

B	CODE OUTPUT		
Engine ID	**Dynamic Response**	**Engine Running**	**ACTION TO TAKE**
2(0), 3(0), 4(0) or 5(0)	1(0) or no display	11	o Engine Running Self-Test indicates a PASS. — If Continuous Memory Codes were present, Go to QUICK TEST STEP 6.0. — If Continuous Memory is a PASS Code 11 and a symptom is present, Go to Quick Test Step 7.0.
2(0), 3(0), 4(0) or 5(0)	1(0) or no display	ANY CODE(S)	o Engine Running Self-Test indicates a FAULT. — Go to part **C** of Engine Running Self-Test. — **Always start with the first code displayed.**
98	NO DISPLAY	ANY CODE(S)	o Code 98 in place of the I.D. code indicates that the vehicle is in FMEM (Failure Mode Effects Management) and DID NOT PASS Key On Engine Off Self-Test. Engine Running Self-Test will not initiate until a PASS Code 11 is obtained in Key On Engine Off Self-Test. — Run Key On Engine Off Self-Test and address all codes displayed.
NO CODES DISPLAYED CODES NOT LISTED			o Self-Test did not activate. — Rerun Engine Running Self-Test to verify the above condition. — If condition is still present, Go to Pinpoint Test Step $\boxed{QA1}$.

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QUICK TEST: Engine Running Self-Test

5.0

C PASSENGER CAR SERVICE CODE CHART

Engine Running Service Code	Pinpoint Test Step Direction												
	1.9L EFI	1.9L CFI	2.3L OHC EFI	2.3L TC EFI	2.3L HSC EFI	2.5L CFI	3.0L EFI	3.0L SHO SEFI	3.8L AXOD SEFI	3.8L RWD SEFI	3.8L SC SEFI	5.0L SEFI	5.0L MA SEFI
12 GO to ▶	KE1	KB23	KE1	KE1	KE1	KB23	KE1	KE1	KE1	KE1	KE1	KE1	KE1
13 GO to ▶	KE15	KB1	KE15	KE15	KE15	KB1	KE15	KE15	KE15	KE15	KE15	KE15	KE15
16 GO to ▶	KE22	KB30	KE1	—	—	KB30	—	—	—	—	—	KE1	KE1
17 GO to ▶	KE26	KB30	—	KE26	—	KB30	—	—	—	—	—	—	—
18 GO to ▶	P1	P1	—	—	P1	—	P1	P1	P1	P1	P1	P1	P1
19 GO to ▶	KE25	KB26	—	—	—	—	—	—	—	—	—	—	—
21 GO to ▶	DE1	DE1	DE1	DE1	DE1	DE1	DE1	DE1	DE1	DE1	DE1	DE1	DE1
22 GO to ▶	DF1	DF7	DF7	DF1	DF7	DF7	DF7	DF1	DF7	DF7	DF1	DF7	DF1
23 GO to ▶	DH1	KB12	DH1	DH1	DH1	KB12	DH1	DH1	DH1	DH1	DH1	DH1	DH1
24 GO to ▶	—	DB1	DB1	DA1	DB1	DB1	DB1	DB1	DB1	DB1	DB1	DB1	DB1
25 GO to ▶	—	—	DG1	DG1	—	—	DG1	DG1	—	—	DG1	—	—
26 GO to ▶	DK1	—	—	DK1	—	—	—	DC1	—	—	DC1	—	DC1
28 GO to ▶	DA1	—	—	DA1	—	—	—	—	—	—	—	—	—
31 GO to ▶	—	DL21	DD1	—	DL21	DN1	DL21	DL21	DL21	DL21	DL21	DN1	DN1
32 GO to ▶	—	DL20	DD11	—	DL20	DN25	DL20	DL20	DL20	DL20	DL20	DN25	DN25
33 GO to ▶	—	DL30	DD11	—	DL30	DN40	DL30	DL30	DL30	DL30	DL30	DN40	DN40
34 GO to ▶	—	DL25	DD11	KA1	DL25	DN50	DL25	DL25	DL25	DL25	DL25	DN50	DN50
35 GO to ▶	—	DL25	DD30	—	DL25	DN5	DL25	DL25	DL25	DL25	DL25	DN5	DN5
41 GO to ▶	H11	H11	H11	H11	H11	H11	H11	H1	H11	H11	H1	H11	H1
42 GO to ▶	H23	H23	H23	H25	H23	H23	H23	H1	H23	H23	H1	H23	H1
44 GO to ▶	—	—	—	—	—	—	—	—	—	—	—	KC1	KC1
45 GO to ▶	—	—	—	—	—	—	—	—	—	—	—	KC1	KC1
46 GO to ▶	—	—	—	—	—	—	—	—	—	—	—	KC1	KC1
47 GO to ▶	KE20	—	—	—	—	—	—	—	—	—	—	—	—
48 GO to ▶	KE21	—	—	—	—	—	—	—	—	—	—	—	—
52 GO to ▶	—	—	—	—	FF5	FF5	FF5	FF5	FF5	—	FF5	—	—
55 GO to ▶	—	QE1	—	—	—	QE1	—	—	—	—	—	—	—
56 GO to ▶	—	—	—	—	—	—	—	DC10	—	—	DC10	—	DC10
58 GO to ▶	—	KB5	—	—	—	KB5	—	—	—	—	—	—	—
66 GO to ▶	—	—	—	—	—	—	—	DC4	—	—	DC4	—	DC4
67 GO to ▶	—	FA1	—	—	—	—	—	—	—	—	—	—	—
68 GO to ▶	—	KB9	—	—	—	KB9	—	—	T90	—	—	—	—
72 GO to ▶	—	—	DF10	—	DF10	—	DF10	X10	—	—	X10	—	—

(Continued)

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QUICK TEST: Engine Running Self-Test

5.0

C PASSENGER CAR SERVICE CODE CHART

Engine Running Service Code	Pinpoint Test Step Direction												
	1.9L EFI	1.9L CFI	2.3L OHC EFI	2.3L TC EFI	2.3L HSC EFI	2.5L CFI	3.0L EFI	3.0L SHO SEFI	3.8L AXOD SEFI	3.8L RWD SEFI	3.8L SC SEFI	5.0L SEFI	5.0L MA SEFI
73 GO to ▷	DH20	—	DH20	DH20	DH20	—	DH20	DH20	—	—	DH20	—	—
74 GO to ▷	—	—	FD1	—	—	FD10	FD10	FD10	FD10	FD10	FD10	FD1	—
75 GO to ▷	—	—	FD5	—	—	—	—	—	—	—	—	FD5	—
76 GO to ▷	DK30	—	—	DK30	—	—	—	—	—	—	—	—	—
77 GO to ▷	M1	—	M1	M1	M1	—	M1	M1	—	—	M1	—	M1
84 GO to ▷	—	DL11	—	—	—	—	—	—	—	—	—	—	—
85 GO to ▷	—	KD6	—	—	—	—	—	—	—	—	—	—	—
87 GO to ▷	—	J7	—	—	—	—	—	—	—	—	—	—	—
91 GO to ▷	—	—	—	—	—	—	—	H1	H11	H11	H1	H11	H1
92 GO to ▷	—	—	—	—	—	—	—	H1	H23	H23	H1	H23	H1
94 GO to ▷	—	—	—	—	—	—	—	—	—	—	—	KC1	KC1
98 GO to ▷	GO TO QUICK TEST STEP 5.0B												
99 GO to ▷	—	KB29	—	—	—	KB29	—	—	—	—	—	—	—
NO CODES ▷ CODES NOT LISTED ▷	Go to Pinpoint Test Step QA1												

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QUICK TEST: Engine Running Self-Test

5.0

C	LIGHT TRUCK SERVICE CODE CHART							
Engine Running Service Code	Pinpoint Test Step Direction							
	2.3L EFI	2.9L EFI	3.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
12 GO to ▶	KE1	KE1	KE1	KE1	KE1	KE1	—	KE1
13 GO to ▶	KE15	KE15	KE15	KE15	KE15	KE15	—	KE15
16 GO to ▶	KE1	—	—	—	—	—	—	—
18 GO to ▶	P1	—	—	P1	P1	P1	—	P1
21 GO to ▶	DE1	DE1	DE1	DE1	DE1	DE1	—	DE1
22 GO to ▶	DF7	DF7	DF7	DF7	DF7	DF7	DF7	DF7
23 GO to ▶	DH1	DQ1	DH1	DH1	DH1	DH1	DQ1	DH1
24 GO to ▶	DB1	DB1	DB1	DB1	DB1	DB1	—	DB1
25 GO to ▶	—	DG1	—	DG1	DG1	—	—	—
26 GO to ▶	—	—	—	—	—	TC30	TC30	TC30
31 GO to ▶	DN1	—	—	DN1	DN1	DN1	—	DN1
32 GO to ▶	DN25	—	—	DN25	DN25	DN25	—	DN25
33 GO to ▶	DN40	—	—	DN40	DN40	DN40	—	DN40
34 GO to ▶	DN50	—	—	DN50	DN50	DN50	—	DN50
35 GO to ▶	DN5	—	—	DN5	DN5	DN5	—	DN5
41 GO to ▶	H11	H11	H11	H11	H11	H11	—	H11
42 GO to ▶	H23	H23	H23	H23	H23	H23	—	H23
44 GO to ▶	—	—	—	KC1	KC1	KC1	—	KC1
45 GO to ▶	—	—	—	KC1	KC1	KC1	—	KC1
46 GO to ▶	—	—	—	KC1	KC1	KC1	—	—
52 GO to ▶	FF5	—	FF5	FF5	FF5	—	—	—
65 GO to ▶	—	—	—	—	—	TC10	TC10	TC10
72 GO to ▶	DF10	DF10	DF10	DF10	DF10	DF10	—	DF10
73 GO to ▶	DH20	DH20	DH20	DH20	DH20	DH20	—	DH20
74 GO to ▶	FD10	FD10	FD10	—	—	FD10	FD10	FD10
77 GO to ▶	M1	M1	M1	M1	M1	M1	—	M1
98 GO to ▶	GO TO QUICK TEST STEP 5.0B							
NO CODES ▶ CODES NOT LISTED ▶	Go to Pinpoint Test Step QA1							

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QUICK TEST: Continuous Self-Test

6.0

A	CONTINUOUS MEMORY CODES

SPECIAL NOTES:

- Verify that a **Pass Code 11** was received in both Key On Engine Off and Engine Running Self-Tests before continuing with this test.
- Refer to Quick Test Appendix for a detailed description of how to use the Continuous Monitor Mode.
- If Continuous Memory is a PASS code 11 and a symptom is present, GO to Quick Test Step 7.0.

DETERMINING THE CONTINUOUS MEMORY CODES TO BE SERVICED

- Refer to the Continuous Memory Codes recorded in Quick Test Step 3.0 A.
- The cause of some of the Continuous Memory Codes may have been eliminated during either Key On Engine Off or Engine Running Self-Test service.
- Address only those Continuous Memory Codes for which faults have not been previously serviced. If the fault has been serviced in Steps 3.0 for 4.0, CLEAR Continuous Memory. Refer to Quick Test Appendix.
- Go to part **B** of Continuous Self-Test.

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QUICK TEST: Continuous Self-Test

6.0

B PASSENGER CAR SERVICE CODE CHART

Continuous Memory Service Code	Pinpoint Test Step Direction												
	1.9L EFI	1.9L CFI	2.3L OHC EFI	2.3L TC EFI	2.3L HSC EFI	2.5L CFI	3.0L EFI	3.0L SHO SEFI	3.8L AXOD SEFI	3.8L RWD SEFI	3.8L SC SEFI	5.0L SEFI	5.0L MA SEFI
13 GO to ▶	—	KB90	—	—	—	KB90	—	—	—	—	—	—	—
14 GO to ▶	N1	N1	N1	N1	N1	N1	N1	N1	N1	N1	N1	N1	N1
15 GO to ▶	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1
18 GO to ▶	N3	N3	N3	N3	N3	N3	N3	N2	N3	N3	N2	N3	N3
19 GO to ▶	—	—	—	—	—	—	—	N10	—	—	N10	—	—
22 GO to ▶	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90
23 GO to ▶	—	KB97	—	—	—	KB97	—	—	—	—	—	—	—
29 GO to ▶	—	—	—	—	DP1	DP1	T1	DP1	T1	DP1	DP1	DP1	DP1
31 GO to ▶	—	DL90	DD90	—	DL90	DN92	DL90	DL90	DL90	DL90	DL90	DN92	DN92
32 GO to ▶	—	DL94	—	—	DL94	DN90	DL94	DL94	DL94	DL94	DL94	DN90	DN90
33 GO to ▶	—	DL97	—	—	DL97	DN95	DL97	DL97	DL97	DL97	DL97	DN95	DN95
34 GO to ▶	—	DL93	—	—	DL93	DN98	DL93	DL93	DL93	DL93	DL93	DN98	DN98
35 GO to ▶	—	DL90	—	—	DL90	DN92	DL90	DL90	DL90	DL90	DL90	DN92	DN92
38 GO to ▶	—	KB91	—	—	—	KB91	—	—	—	—	—	—	—
39 GO to ▶	—	—	—	—	—	—	T30	—	T30	—	—	—	—
41 GO to ▶	H30	H29	H29	H30	H29	H29	H29	H29	H29	H29	H29	H29	H29
42 GO to ▶	H30	—	—	H30	—	—	—	—	—	—	—	—	—
43 GO to ▶	H30	—	—	—	—	—	—	—	—	—	—	—	—
45 GO to ▶	—	—	—	—	—	—	—	N13	—	—	N13	—	—
46 GO to ▶	—	—	—	—	—	—	—	N13	—	—	N13	—	—
48 GO to ▶	—	—	—	—	—	—	—	N13	—	—	N13	—	—
49 GO to ▶	—	—	—	—	—	—	—	P10	—	—	P10	—	—
51 GO to ▶	DE90	DE90	DE90	DE90	DE90	DE90	DE90	DE90	DE90	DE90	DE90	DE90	DE90
53 GO to ▶	DH90	KB93	DH90	DH90	DH90	KB93	DH90	DH90	DH90	DH90	DH90	DH90	DH90
54 GO to ▶	—	DB90	DB90	DA90	DB90	DB90	DB90	DB90	DB90	DB90	DB90	DB90	DB90
56 GO to ▶	DK90	—	—	DK90	—	—	—	DC10	—	—	DC10	—	DC10
57 GO to ▶	—	—	—	—	—	—	T40	—	T40	—	—	—	—
58 GO to ▶	DA90	—	—	—	—	—	—	—	—	—	—	—	—
59 GO to ▶	—	—	—	—	—	—	T20	X95	T20	—	—	—	—
61 GO to ▶	DE93	DE93	DE93	DE93	DE93	DE93	DE93	DE93	DE93	DE93	DE93	DE93	DE93
63 GO to ▶	DH94	KB97	DH94	DH94	DH94	KB97	DH94	DH94	DH94	DH94	DH94	DE94	DH94
64 GO to ▶	—	DB93	DB93	DA93	DB93	DB93	DB93	DB93	DB93	DB93	DB93	DB93	DB93
65 GO to ▶	H30	—	—	—	—	—	—	—	—	—	—	—	—

(Continued)

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QUICK TEST: Continuous Self-Test

6.0

B PASSENGER CAR SERVICE CODE CHART

Continuous Memory Service Code	Pinpoint Test Step Direction												
	1.9L EFI	1.9L CFI	2.3L OHC EFI	2.3L TC EFI	2.3L HSC EFI	2.5L CFI	3.0L EFI	3.0L SHO SEFI	3.8L AXOD SEFI	3.8L RWD SEFI	3.8L SC SEFI	5.0L SEFI	5.0L MA SEFI
66 GO to ▶	DK93	—	—	DK93	—	—	—	DC4	—	—	DC4	—	DC4
67 GO to ▶	FA1	—	—	FA1	—	—	—	—	—	—	FA1	—	—
68 GO to ▶	DA93	—	—	DA93	—	—	—	—	T90	—	—	—	—
69 GO to ▶	—	—	—	—	—	—	T10	—	T10	—	—	—	—
70 GO to ▶	—	—	—	—	—	—	—	—	ML25	—	—	—	—
71 GO to ▶	QE1	KB92	—	—	—	KB92	—	—	ML25	—	—	—	—
72 GO to ▶	QE4	—	—	—	—	—	—	—	ML25	—	—	—	—
83 GO to ▶	—	—	—	—	—	—	—	X15	—	—	—	—	—
85 GO to ▶	H30	—	—	—	—	—	—	—	—	—	—	—	—
86 GO to ▶	H30	—	—	—	—	—	—	—	—	—	—	—	—
87 GO to ▶	—	J95	—	—	J95	X104	X104	X104	X104	J95	J95	J95	J95
91 GO to ▶	—	—	—	—	—	—	—	H29	H29	H29	H29	H29	H29
95 GO to ▶	J90	J90	—	—	J90	X100	X100	X100	X100	J90	J90	—	J90
96 GO to ▶	J93	J93	—	—	J93	X102	X102	X102	X102	J93	J93	—	J93
NO CODES ▶ CODES NOT LISTED ▶	Go to Pinpoint Test Step QA1												

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QUICK TEST: Continuous Self-Test

6.0

B	LIGHT TRUCK SERVICE CODE CHART							
Continuous Memory Service Code	**Pinpoint Test Step Direction**							
	2.3L EFI	**2.9L EFI**	**3.0L EFI**	**4.9L EFI**	**5.0L EFI**	**5.8L EFI**	**7.3L DIESEL**	**7.5L EFI**
14 GO to ▶	N1	N1	N1	N1	N1	N1	DI1	N1
15 GO to ▶	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1
18 GO to ▶	Sect 13	N3	N3	N3	N3	N3	—	N3
22 GO to ▶	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90
28 GO to ▶	N3	—	—	—	—	—	—	—
29 GO to ▶	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1
31 GO to ▶	DN92	—	—	DN92	DN92	DN92	—	DN92
32 GO to ▶	DN90	—	—	DN90	DN90	DN90	—	DN90
33 GO to ▶	DN95	—	—	DN95	DN95	DN95	—	DN95
34 GO to ▶	DN98	—	—	DN98	DN98	DN98	—	DN98
35 GO to ▶	DN92	—	—	DN92	DN92	DN92	—	DN92
41 GO to ▶	H29	H29	H29	H29	H29	H29	—	H29
48 GO to ▶	N3	—	—	—	—	—	—	—
49 GO to ▶	—	—	—	—	—	TC90	TC90	TC90
51 GO to ▶	DE90	DE90	DE90	DE90	DE90	DE90	—	DE90
53 GO to ▶	DH90	DH90	DH90	DH90	DH90	DH90	DQ90	DH90
54 GO to ▶	DB90	DB90	DB90	DB90	DB90	DB90	—	DB90
56 GO to ▶	—	—	—	—	—	TC90	TC90	TC90
59 GO to ▶	—	—	—	—	—	TC90	TC90	TC90
61 GO to ▶	DE93	DE93	DE93	DE93	DE93	DE93	—	DE93
62 GO to ▶	—	—	—	—	—	TC90	TC90	TC90
63 GO to ▶	DH94	DH94	DH94	DH94	DH94	DH94	DQ94	DH94
64 GO to ▶	DB93	DB93	DB93	DB93	DB93	DB93	—	DB93
66 GO to ▶	—	—	—	—	—	TC90	TC90	TC90
67 GO to ▶	—	—	—	—	—	TC90	TC90	TC90
69 GO to ▶	—	—	—	—	—	TC90	TC90	TC90
87 GO to ▶	J95	J95	J95	J95	J95	J95	—	J95
88 GO to ▶	N20	—	—	—	—	—	—	—
95 GO to ▶	J90	J90	J90	J90	J90	J90	—	J90
96 GO to ▶	J93	J93	J93	J93	J93	J93	—	J93
99 GO to ▶	—	—	—	—	—	TC90	TC90	TC90
NO CODES ▶ CODES NOT LISTED ▶	Go to Pinpoint Test Step QA1							

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QUICK TEST: Diagnostic By Symptom

7.0

A DIAGNOSTIC BY SYMPTOM

SPECIAL NOTES:

- Verify that a **Pass Code 11** was received in Key On Engine Off, Engine Running and Continuous Self-Tests before continuing with this test.
- If a symptom is present and the EEC system is suspected, Go to part **B** of Diagnostic By Symptom. If the EEC system is not suspected, GO to Section 2, Diagnostic Routines.

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QUICK TEST: Diagnostic By Symptom

7.0

B	PASSENGER CAR DIAGNOSTIC BY SYMPTOM												
Symptom	**Pinpoint Test Step Direction**												
	1.9L EFI	**1.9L CFI**	**2.3L OHC EFI**	**2.3L TC EFI**	**2.3L HSC EFI**	**2.5L CFI**	**3.0L EFI**	**3.0L SHO SEFI**	**3.8L AXOD SEFI**	**3.8L RWD SEFI**	**3.8L SC SEFI**	**5.0L SEFI**	**5.0L MA SEFI**
Engine runs rough or misses Lack of power Rough idle Erratic rpm Surges Hesitation	S2	S2	S2	S2	S2	S2	S2	S2*	S2	S2	S2*	S2	S2*
Stalls in Self-Test Engine stalls	S1	S2	S1	S1	S1	S2	S1	S1	S1	S1	S1	S1	S1
Stall during parking maneuvers	—	FF3	FF3	—	—	FF3	FF3	FF3	FF3	—	—	—	—
Surges with A/C on at idle	—	—	KM20	—	KM20	—	—	—	—	—	—	—	—
A/C does not cut off under WOT conditions	KM15	KM15	KM15	KM15	KM15	X52	X52	X52	X52	KM15	X52	KM15	KM15
A/C not functioning	XM1	KM1	KM1	KM1	KM1	X50	X50	X50	X50	KM1	X50	KM1	KM1
A/C compressor runs continuously	—	—	KM35	—	—	—	—	—	—	—	—	—	—
High idle speeds on each restart may be accompanied by spark knock for up to 3-5 minutes after a start	KA1	—	—	DG1	—	—	—	—	—	—	—	—	—
Low idle with A/C On	FA1	FA10	FA10	FA10	FA10	FA10	FA10	FA10	FA10	FA10	FA10	FA10	FA10
High idle in Drive, automatic trans. only	—	—	—	—	—	FA20	—	—	—	FA20	—	—	—

(Continued)

* Verify MAF sensor is properly connected.

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QUICK TEST: Diagnostic By Symptom

7.0

B	PASSENGER CAR DIAGNOSTIC BY SYMPTOM												
Symptom	Pinpoint Test Step Direction												
	1.9L EFI	1.9L CFI	2.3L OHC EFI	2.3L TC EFI	2.3L HSC EFI	2.5L CFI	3.0L EFI	3.0L SHO SEFI	3.8L AXOD SEFI	3.8L RWD SEFI	3.8L SC SEFI	5.0L SEFI	5.0L MA SEFI
Shift indicator light always On or Off	KL1	KL1	—	—	KL1	KL1	—	—	—	—	KL1	—	KL1
"CHECK ENGINE" light always on	ML1	ML1	ML1	ML1	ML1	ML1	ML1	ML1	ML1	ML1	ML1	ML1	ML1
"CHECK ENGINE" light never on	ML5	ML5	ML5	ML5	ML5	ML5	ML5	ML5	ML5	ML5	ML5	ML5	ML5
"CHECK ENGINE"/ "CHECK DCL" Message On	—	—	—	—	—	—	—	—	ML25	—	—	—	—
"CHECK ENGINE" Message On	—	—	—	—	—	—	—	—	ML20	—	—	—	—
"CHECK ENGINE" light on intermittently	ML10	ML10	ML10	ML10	ML10	ML10	ML10	ML10	ML10	ML10	ML10	ML10	ML10
"CHECK ENGINE" light flashing with erratic idle	ML15	ML15	ML15	ML15	ML15	ML15	ML15	ML15	ML15	ML15	ML15	ML15	ML15
Lack of power at wide open throttle	—	—	—	—	—	—	—	KT6	—	—	—	—	—
Lack of cruise control and decel stalls	—	—	—	—	—	DP1	—	—	—	—	—	—	—
Vehicle tachometer not operating	—	—	—	—	—	—	—	N3	—	—	—	—	—

(Continued)

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QUICK TEST: Diagnostic By Symptom

7.0

B PASSENGER CAR DIAGNOSTIC BY SYMPTOM

Symptom	Pinpoint Test Step Direction												
	1.9L EFI	**1.9L CFI**	**2.3L OHC EFI**	**2.3L TC EFI**	**2.3L HSC EFI**	**2.5L CFI**	**3.0L EFI**	**3.0L SHO SEFI**	**3.8L AXOD SEFI**	**3.8L RWD SEFI**	**3.8L SC SEFI**	**5.0L SEFI**	**5.0L MA SEFI**
Stumble after hot restart	H20	H20	H20	H20	H20	H20	H20	H20	H20	H20	H20	H20	H20
Engine will not restart	—	QE1	—	—	—	QE1	—	—	—	—	—	—	—
Fuel pump runs with engine off	—	—	J22	J22	—	X14	X14	X14	—	—	J22	J22	—
Gasoline fumes under hood	KD1	KD1	—	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1
Spark knock	KA1 or VOL. H SEC. 6	—	DG1 or VOL. H— SEC. 6	DG2 or VOL. H SEC.6	—	—	DG1 or VOL.H SEC. 6		—	—	KP1	—	—
Poor performance, lack of turbo boost	—	—	—	KN1	—	—	—	—	—	—	KS6	—	—
Low boost pressure	—	—	—	KN10	—	—	—	—	—	—	KS6	—	—
No engine cooling fan	—	—	—	—	—	X40 MTX ONLY	—	X40	—	—	—	—	—
Low speed cooling fan does not operate High speed cooling fan does not operate Low or high speed cooling fan does not operate	—	—	—	—	—	X20 CLC ONLY	X20	—	X20	—	X20	—	—
Low or high speed cooling fan always on	—	—	—	—	—	X35	X35	X35	X35	—	X38	—	—
High Boost Pressure	—	—	—	KN10	—	—	—	—	—	—	KS6	—	—

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QUICK TEST: Diagnostic By Symptom

7.0

B	LIGHT TRUCK DIAGNOSTIC BY SYMPTOM							
Symptom	Pinpoint Test Step Direction							
	2.3L EFI	2.9L EFI	3.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
Engine runs rough or misses Engine stalls Lack of power Rough idle Erratic rpm Surges Stalls in Self-Test	S1	S1	S1	S1	S1	S1	—	S1
Stall during parking maneuvers	FF3	FF3	FF3	FF3	FF3	—	—	—
A/C Compressor runs continuously	KM35	—	—	FA18	—	—	—	—
Surges with A/C on at idle	KM30	—	—	—	—	—	—	—
A/C does not cut off under WOT conditions	KM15	KM15	KM15	—	—	—	—	—
A/C not functioning	KM1	KM1	KM1	FA17	—	—	—	—
Low idle with A/C On	FA10	FA10	FA10	FA10	FA10	FA10	—	FA10
"CHECK ENGINE" light always on	ML1	ML1	ML1	ML1	ML1	ML1	—	ML1
"CHECK ENGINE" light never on	ML5	ML5	ML5	ML5	ML5	ML5	—	ML5
"CHECK ENGINE" Light on intermittently	ML10	ML10	ML10	ML10	ML10	ML10	—	ML10
"CHECK ENGINE" Light flashing with erratic idle	ML15	ML15	ML15	ML15	ML15	ML15	—	ML15
Stumble after hot restart	H20	H20	H20	H20	H20	H20	—	H20

(Continued)

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QUICK TEST: Diagnostic By Symptom

7.0

B LIGHT TRUCK DIAGNOSTIC BY SYMPTOM

Symptom	Pinpoint Test Step Direction							
	2.3L EFI	2.9L EFI	3.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
Fuel pump runs with engine off	J22	—	—	—	—	—	—	—
Gasoline fumes under hood	—	—	—	—	—	—	—	KD1
Spark knock	VOL. H SEC. 6	—	—	DG1 or VOL. H SEC. 6	DG1 or VOL. H SEC. 6	—	—	—
Poor idle quality Rolling idle Shifts harshly Poor fuel economy	—	—	DP1	—	—	—	DI1	—
High idle A/C not functioning	—	—	—	FA15	FA15	—	—	FA15
Overdrive Cancel Indicator (OCI) light always off (E4OD only)	—	—	—	—	—	TC13	TC13	TC13
Hard to Start (cold)	N25	—	—	—	—	—	—	—
Tachometer Inoperative (Vehicles with Tachometer)	—	—	—	—	—	—	DI1	—
4 x 4 Low Indicator Light Always Off (E4OD Only)	—	—	—	—	—	TC11	TC11	TC11

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APPENDIX: Self-Test Description

The Self-Test is divided into three specialized tests: Key On Engine Off Self-Test, Engine Running Self-Test, and Continuous Self-Test. The Self-Test is not a conclusive test by itself, but is used as a part of the functional Quick-Test diagnostic procedure. The processor stores the Self-Test program in its permanent memory. When activated, it checks the EEC-IV system by testing its memory integrity and processing capability, and verifies that various sensors and actuators are connected and operating properly.

The Key On Engine Off and Engine Running Self-Tests are functional tests which only detect faults present at the time of the Self-Test. Continuous Self-Test is an ongoing test that stores fault information for retrieval at a later time.

KEY ON ENGINE OFF SELF-TEST

At this time, a test of the EEC-IV system is conducted with power applied and engine at rest.

For Self-Test to detect errors in the Key On Engine Off Self-Test mode, the fault must be present at the time of testing. For intermittents, refer to Continuous Memory Codes.

SEPARATOR PULSE

A single 1/2 second separator pulse is issued 6-9 seconds after the last Key On Engine Off Test code. Then, 6-9 seconds after the single 1/2 second separator pulse, the Continuous Memory Codes will be issued.

CONTINUOUS MEMORY CODES

Continuous Memory Codes are issued as a result of information stored during continuous Self-Test, while the vehicle was in normal operation. These codes are displayed only during Key On Engine Off testing and after the separator code. These codes should be used for diagnosis only when Key On Engine Off and Engine Running Self-Tests result in code 11 and all Quick Test Steps 1.0 through 5.0 have been successfully completed.

NOTE: The separator code and Continuous Memory Codes follow Key On Engine Testing codes ONLY.

ENGINE RUNNING SELF-TEST

At this time, a test of the EEC-IV system is conducted with the engine running. The sensors are checked under actual operating conditions and at normal operating temperatures. The actuators are exercised and checked for expected results.

ENGINE IDENTIFICATION CODES (ID CODES)

Engine ID codes are issued at the beginning of the Engine Running Self-Test and are one-digit numbers represented by the number of pulses sent out. For gasoline engines, the engine ID code is equal to one-half the number of engine cylinders (i.e. 2 pulses = 4 cylinders). For the 7.3L Diesel engine, the ID code = 5. These codes are used to verify the proper processor is installed and that the Self-Test has been entered.

DYNAMIC RESPONSE CHECK

The dynamic response check verifies the movement of the TP, VAF, and MAP sensors during the brief Wide-Open Throttle (WOT) performed during the Engine Running Self-Test. The signal for the operator to perform the brief WOT is a single pulse or 10 code on the STAR Tester.

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APPENDIX: Self-Test Description

POWER STEERING PRESSURE SWITCH TEST

On vehicles equipped with Power Steering Pressure Switch (PSPS), the steering wheel must be turned one-half turn and released AFTER the ID Code has been displayed. This tests the ability of the EEC-IV system to detect a change of state in the Power Steering Pressure Switch.

BRAKE ON/OFF SWITCH TEST

On vehicles equipped with Brake ON/OFF Switch (BOO), the brake pedal MUST be depressed and released AFTER the ID Code has been displayed. This tests the ability of the EEC-IV system to detect a change of state in the Brake ON/OFF Switch.

OVERDRIVE CANCEL SWITCH TEST

On vehicles equipped with Overdrive Cancel Switch (OCS), the switch must be cycled after the ID code has been displayed. This tests the ability of the EEC-IV system to detect a change of state in the Overdrive Cancel Switch.

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APPENDIX: Code Output Format

SERVICE CODES

The EEC-IV system communicates service information through the Self-Test service codes. These service codes are two-digit numbers representing the results of Self-Test.

The service codes are transmitted on the Self-Test output (STO) line found in the vehicle Self-Test connector. They are in the form of timed pulses, and are read by the technician on a voltmeter, STAR tester, "Check Engine" Light (MIL) or on the Continental message center.

SELF-TEST OUTPUT CODE FORMAT
KEY ON ENGINE OFF AND CONTINUOUS MEMORY CODES

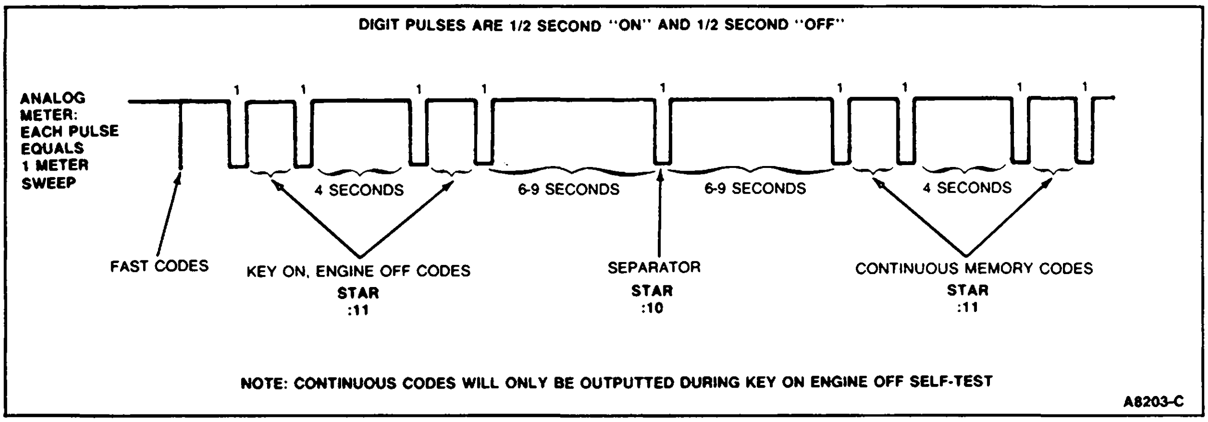

Figure 1 Key On Engine Off and Continuous Memory Code Format

SELF-TEST OUTPUT CODE FORMAT
ENGINE RUNNING CODES

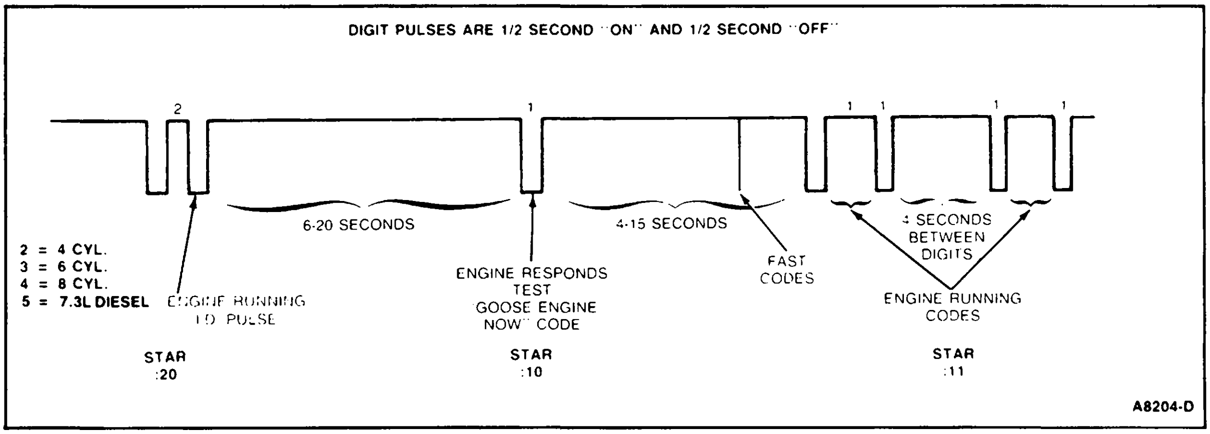

Figure 2 Engine Running Self-Test Code Format

Fast Codes

Fast codes are issued prior to regular service codes. These codes contain the identical information as the regular service codes but are transmitted at 100 times the normal rate. These codes are interpreted by special equipment at the end of the assembly line by the Body and Assembly Division.

Some meters in service detect these codes as a short burst of information (slight meter deflection).

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APPENDIX: Continuous Self-Test

The Continuous Memory service codes are separated from the Quick Test Key On Engine Off codes by a single separator pulse, Figure 3.

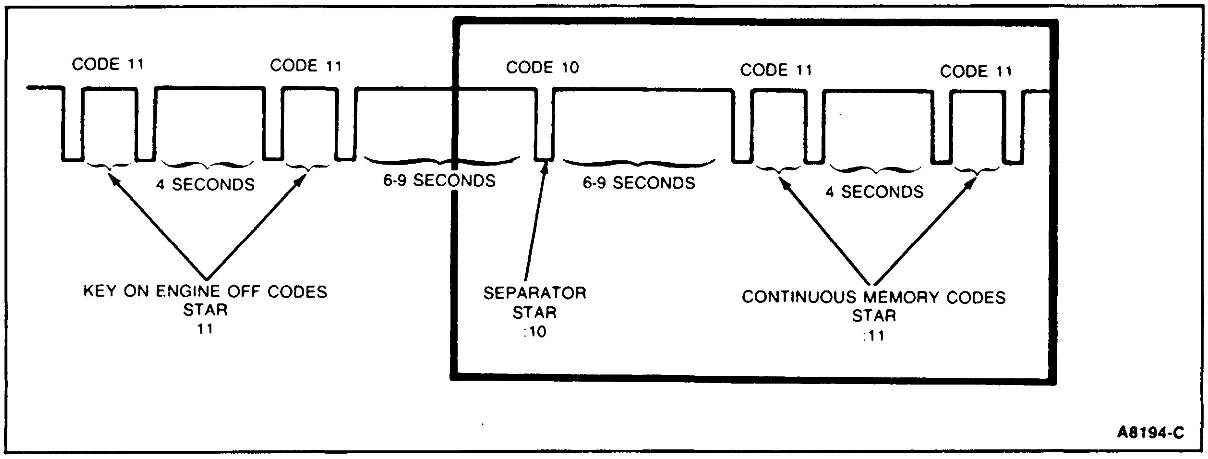

Figure 3 Continuous Memory Code Format

The Continuous Memory codes should never be used for Diagnosis until the Key On Engine Off and Engine Running Self-Tests result in a pass code 11.

During this mode of testing the EEC-IV Processor continuously monitors inputs for opens and shorts. The Continuous Memory Codes must be retrieved within 40 engine temperature warm up cycles. On the 41st Engine Temperature cycle, the service code will be automatically erased. The Continuous Memory Codes can also be erased by deactivating Self-Test while the service codes are being outputted.

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APPENDIX: Self-Test With STAR Tester

READING CODES — SELF-TEST AUTOMATIC READOUT (STAR) TESTER

After hooking up the STAR tester and turning on its power switch, the tester will run a display check and the numerals 88 will begin to flash in the display window (Figure 4). A steady 00 will then appear to signify that the STAR tester is ready to start the Self-Test and receive the test's service codes.

To receive the service codes, press the push button at the front of the STAR tester. The button will latch down, and a colon will appear in the display window in front of the 00 numerals. The colon **must** be displayed to receive the service codes.

If, for any reason, the technician wishes to clear the display window during the Self-Test, he must turn off the vehicle's engine, press the tester's push button once to unlatch it (colon will disappear), then press the button again to latch down the button (colon will appear again).

The STAR tester will display the last service code received, even after disconnecting it from the vehicle. It will hold the service code on the display until the power is turned off or the push button is unlatched and relatched.

For a detailed description of the STAR tester and the variety of tests that can be run, refer to the instruction manual provided with the tester.

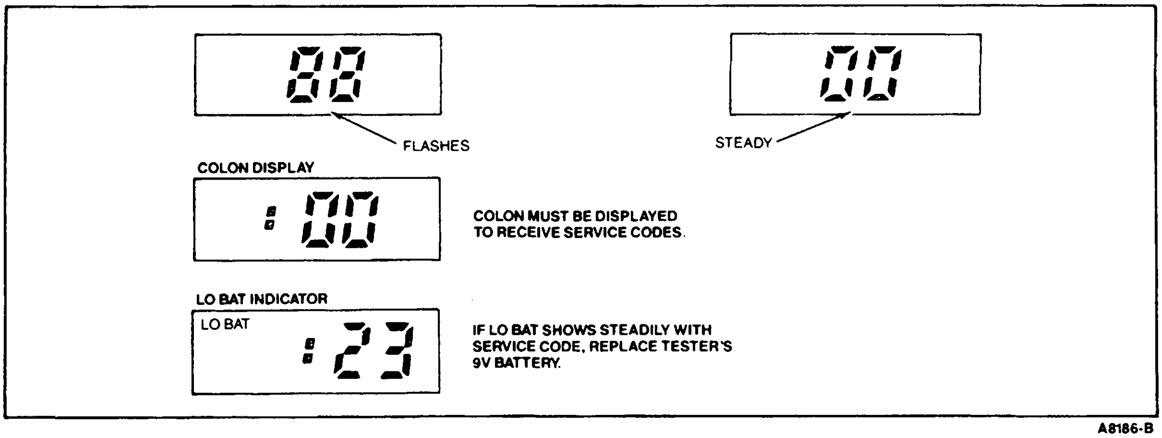

Figure 4 Star Tester Output Code Format

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APPENDIX: Self-Test With SUPER STAR II Tester

The SUPER STAR II Tester can read fast codes as well as slow codes, and can be used on Ford EEC-IV as well as MCU and MECS systems. A built-in Self Test memory will retain the codes as they are received. The SUPER STAR II tester also contains a beeper for running the wiggle tests.

After hooking up the SUPER STAR II tester and turning it on, the SUPER STAR II will briefly display 888. It will also light all the prompts on the left side of the display and the speaker will beep. When the tester is ready, both the STI-LO and STO-LO will be on, but the readout will be blank if the vehicle key is off.

Key On Engine Off (KOEO) Self-Test

1. Plug in both connectors of the tester to the mating connectors of the vehicle.
2. Determine the type of system you have (EEC-IV or MECS) and set the switch to the proper type.
3. Select fast code mode or slow code mode with the mode selector switch.
4. Turn on the power to the tester.
5. Turn on the vehicle ignition key.
6. Depress the test button on the tester to the test position.

The tester will now read any Self-Test codes in this mode.

Key On Engine Running (KOER) Self-Test

1. Start and warm up the engine until it is at a normal running temperature.
2. Turn the engine off.
3. Restart the engine, then depress the test button to the test position.

The tester will now display an engine I.D. code, and on certain vehicles, a Dynamic Response code. Then, service codes will be displayed.

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APPENDIX: Self-Test With SUPER STAR II Tester

For a detailed description of the variety of tests that can be run with the SUPER STAR II, refer to the instruction manual provided with the tester.

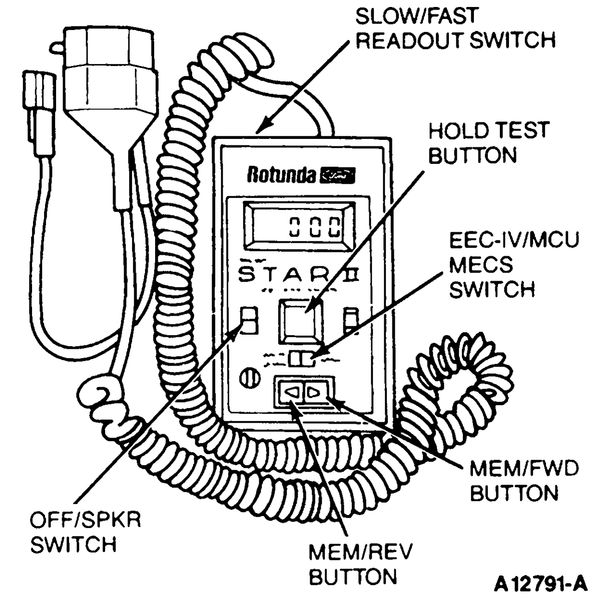

Figure 5 SUPER STAR II Tester

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APPENDIX: Self-Test With Analog Voltmeter

READING CODES — ANALOG VOLTMETER

When a service code is reported on the analog voltmeter for a function test, it will represent itself as a pulsing or sweeping movement of the voltmeter's needle across the dial face of the voltmeter (Figure 6). Therefore, a single-digit number of three will be reported by three needle pulses (sweeps). However, as previously stated, a service code is represented by a two-digit number, such as 2-3. As a result, the Self-Tests service code of 2-3 will appear on the voltmeter as two needle pulses (sweeps), then, after a two-second pause, the needle will pulse (sweep) three times.

The Continuous Memory Codes are separated from the Key On Engine Off codes by a six-second delay, a single half-second sweep, and another six-second delay. They are produced on the voltmeter in the same manner as the Key On Engine Off codes.

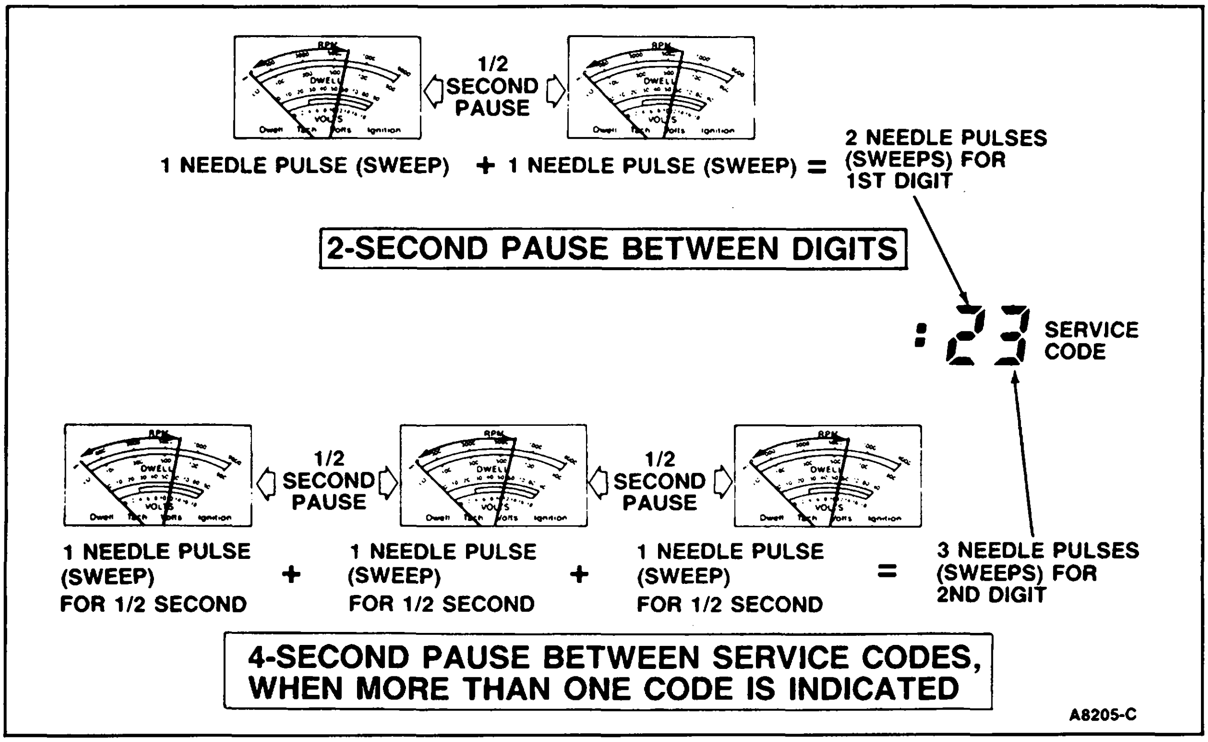

Figure 6 Analog Voltmeter Output Code Format

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APPENDIX: Self-Test With "Check Engine" Light (MIL)

READING CODES — "CHECK ENGINE" LIGHT (MIL)

During Self-Test a service code is reported by the "Check Engine" Light. It will represent itself as a flash on the "Check Engine" Light display on the dash panel (Figure 7). A single-digit number of three will be reported by three flashes.

However, as previously stated, a service code is represented by a two-digit number, such as 2-3. As a result, the Self-Test service code of 2-3 will appear on the "Check Engine" Light display as two flashes, then, after a two-second pause, the light will flash three times.

The Continuous Memory Codes are separated from the Key On Engine Off codes by a six-second delay, a single half-second flash, and another six-second delay. They are produced on the "Check Engine" Light display in the same manner as the Key On Engine Off codes.

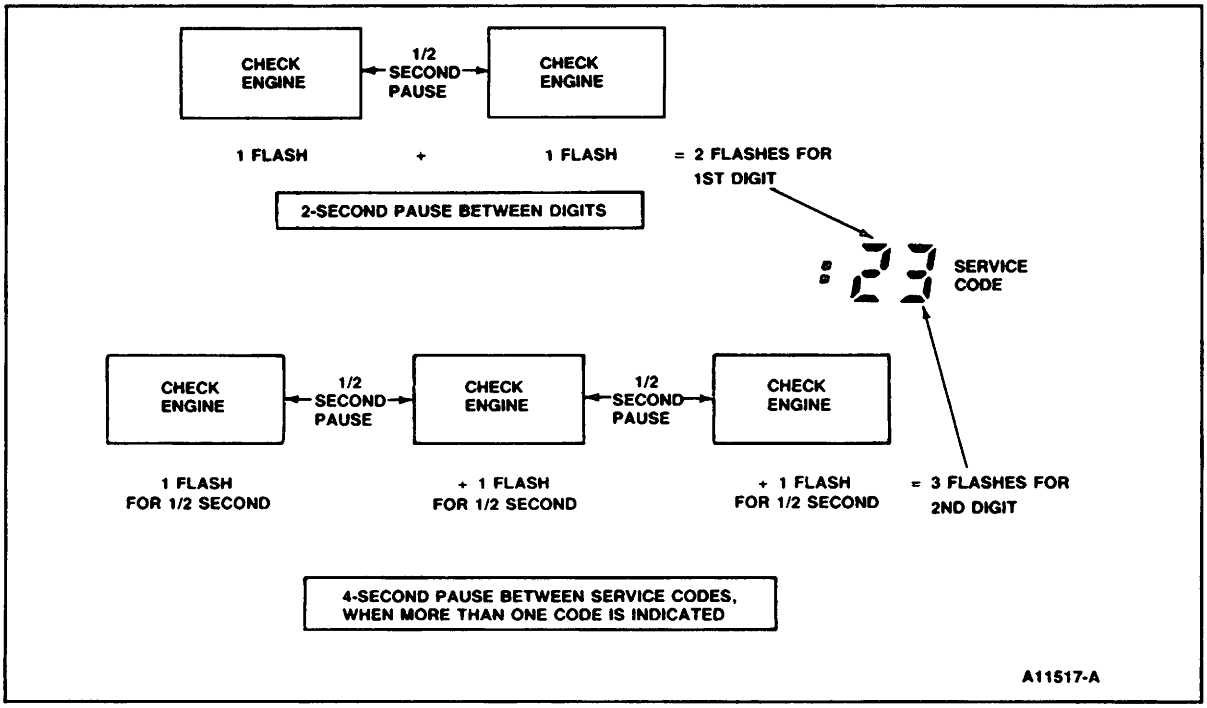

Figure 7 "Check Engine" Light Output Code Format

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APPENDIX: Self-Test With Message Center (Continental Only)

HOW TO RUN SELF-TEST USING THE CONTINENTAL MESSAGE CENTER

1. On the Electronic Instrument Cluster, hold in all three buttons (SELECT, RESET and SYSTEM CHECK) at the same time.

2a. Key On Engine Off Self-Test

- While holding in all three buttons, place ignition switch in the ON position. Release buttons.

3. Engine Running Self-Test

- While holding in all three buttons, start engine. Release buttons.

4. Press the SELECT button three times.

5. To initiate Self-Test, jumper STI to SIG RTN at the Self-Test connectors, or use a STAR Tester and latch the center button in the down position.

   — Key On Engine Off

   - A base readout of 4255 indicates that Self-Test has been entered successfully.

   — Engine Running

   - A base readout of 4030 indicates the engine ID code (one-half the number of engine cylinders, i.e., 30 → 6 cylinders) and that Self-Test has been entered successfully.

6. Service code output will be the right three digits displayed (e.g. PASS code readout: 4011).

7. To exit Self-Test, turn ignition switch to OFF and remove jumper or unlatch STAR Tester.

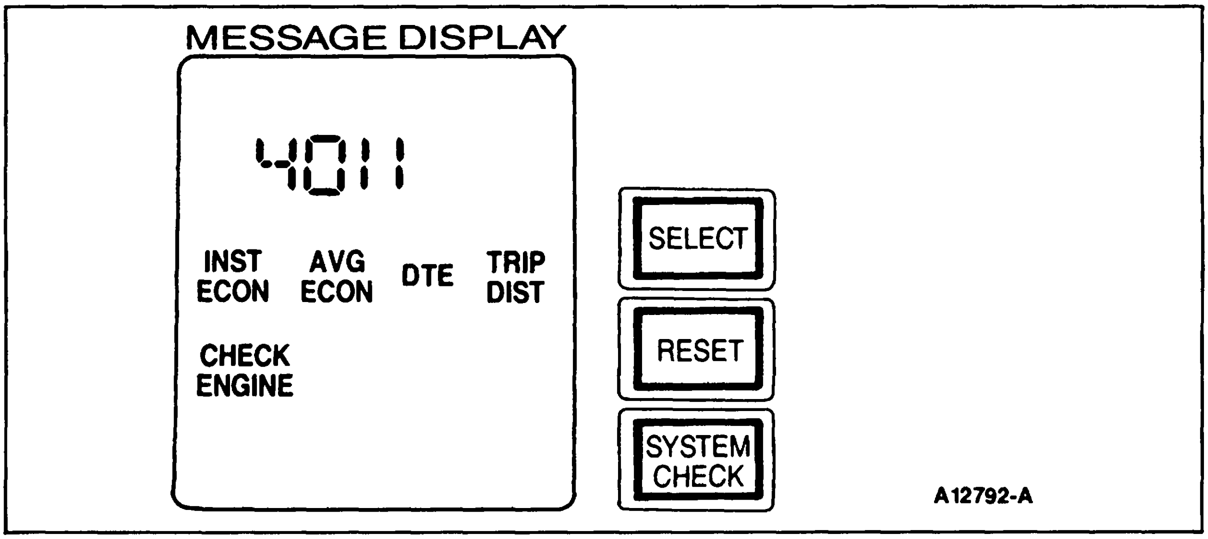

Figure 8 Message Center in Self-Test Mode

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APPENDIX: Self-Test With Overdrive Cancel/Transmission Malfunction Indicator Light — OCIL/TMIL

READING CODES — OVERDRIVE CANCEL/TRANSMISSION MALFUNCTION INDICATOR LIGHT (OCIL/TMIL)

The OCIL/TMIL serves a dual purpose on the 7.3L Diesel vehicle with E40D transmissions.

— The light stays OFF when the Overdrive Cancel Switch (OSC) is toggled once on the instrument panel — indicating that the vehicle can attain the overdrive gear position.

— The light stays ON when the Overdrive Cancel Switch (OSC) is toggled again on the instrument panel — indicating that the vehicle is prevented from shifting into the overdrive gear position.

— If the light flashes, then perform Key On Engine Off Self-Test. A code 99 indicates a fault in the E40D Transmission Electronic Pressure Control (EPC) circuit. **The light under this condition serves as the Transmission Malfunction Indicator Light (TMIL).**

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APPENDIX: Diagnostic Aids

CONTINUOUS MONITOR MODE (WIGGLE TEST)

SPECIAL NOTE:

- The Continuous Monitor Modes allow the technician to **ATTEMPT** to re-create an intermittent fault.

KEY ON ENGINE OFF WIGGLE TEST PROCEDURE

1. Hook up a STAR Tester or VOM as shown in Quick Test Step 2.0.
2. Turn the Self-Test ignition key to the ON position.
3. Activate, wait 10 seconds, deactivate and reactivate Self-Test.
4. You are now in the Continuous Monitor Mode.
5. Tap, move, and wiggle the suspect sensor and/or harness. When a fault is detected, a Continuous Memory Code will be stored in memory. This will be indicated as follows depending on the type of equipment being used:
   - STAR Tester: Red LED lights and/or continuous tone.
   - Check Engine Light: Lights
   - VOM: Needle Sweep

ENGINE RUNNING WIGGLE TEST PROCEDURE

1. Hook up a STAR Tester or VOM as shown in Quick Test Step 2.0.
2. Key off, wait 10 seconds.
3. Start the engine.
4. Activate Self-Test, wait 10 seconds, deactivate and reactivate Self-Test. **DO NOT** shut the engine off.
5. You are now in the Engine Running Continuous Monitor Mode.
6. Tap, move, and wiggle the suspect sensor and/or harness. When a fault is detected, a Continuous Memory Code will be stored in memory. This will be indicated as follows depending on the type of equipment being used:
   - STAR Tester: Red LED lights and/or continuous tone.
   - Check Engine Light (MIL): Lights
   - VOM: Needle Sweep

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APPENDIX: Diagnostic Aids

HOW TO CLEAR THE CONTINUOUS MEMORY CODES

NOTE: Do not disconnect battery to clear Continuous Memory Codes. This will erase the Keep Alive Memory (KAM) information which may cause a driveability concern.

1. Run the Key On Engine Off Self-Test according to Quick Test Step 3.0A.
2. When the Service Codes begin to be displayed, deactivate Self-Test:
   - STAR Tester: Unlatching the center button (up position).
   - Analog VOM: Remove the jumper wire from between Self-Test Input (STI) connector and the Signal Return Pin of the Self-Test connector.
   - "Check Engine" Light (MIL): Remove the jumper wire from between Self-Test Input (STI) connector and the SIGNAL RETURN pin of the Self-Test connector.
   - Message Center (Continental Only): Remove the jumper wire from between Self-Test input (STI) connector and the SIGNAL RETURN pin of the Self-Test connector.
3. The Continuous Memory codes will be erased from the processor's memory.

HOW TO CLEAR KEEP ALIVE MEMORY (KAM)

The processor stores information about vehicle operating conditions and uses this information to compensate for component tolerances. When EGR, HEGO, INJECTORS, MAP/BP, TPS or VAF are replaced, Keep Alive Memory (KAM) should be cleared to erase the information stored by the processor from the original component.

To clear KAM: Disconnect the negative side of the battery for a minimum of five minutes.

After KAM has been cleared, the vehicle may exhibit certain driveability concerns. It will be necessary to drive the vehicle 10 miles or more to allow the processor to relearn values for optimum driveability and performance. (Distance is dependent on the vehicle application.)

OUTPUT STATE CHECK

The output state check aids in servicing output actuators associated with the EEC-IV system. It enables the technician to energize and de-energize most of the system output actuators on command. This mode is entered after all codes have been received from Key On Engine Off and Continuous Testing. At this time, leave Self-Test activated and depress the throttle. Each time the throttle is depressed the output actuators will change state from energized to de-energized or from de-energized to energized.

1. Enter Self-Test.
2. Code Output Ends.
3. Do Brief WOT.
4. EEC-IV Output To Actuators Energized.
5. Do Brief WOT.
6. EEC-IV Output To Actuators De-Energized.

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APPENDIX: Diagnostic Aids

CYLINDER BALANCE TEST — SEFI ENGINES

The purpose of the cylinder balance test is to assist the mechanic in finding a weak or non-contributing cylinder. The test is entered by depressing and releasing the throttle within two minutes after the Engine Running Self-Test codes have been output.

Once the test is entered, the idle speed control duty is fixed and the engine is allowed to stabilize. Engine rpm is measured and stored for later use. Next, the fuel is shut off to cylinder number 8 (or 6, depending on engine). After a brief stabilization period the engine rpm is again measured and stored. The injector is turned on again and the process is repeated for each of the injectors down to one. At this point, the maximum rpm drop that occurred is selected from the table of rpm drops for each cylinder. This maximum rpm drop is now multiplied by a calibratable percentage. The resulting number (rpm) is now used as the minimum rpm that each cylinder must have dropped to pass this test.

Example: 150 rpm x 65% = 98 rpm

If all cylinders drop at least this amount, then a code 90 is output indicating a pass. No further testing is necessary. If a cylinder did not drop at least this amount, then the cylinder number would be output. For example, 30 for cylinder number 3. This indicates that cylinder number 3 is either weak or non-contributing.

The test can now be repeated a second time if the throttle is depressed and released within two minutes of the last code output. This time the maximum rpm drop that occurs is multiplied by a lower percentage. This number is now used as the minimum rpm drop for each cylinder to pass this test.

Example: 150 rpm x 43% = 65 rpm

If all the rpm drops are greater than 65 rpm, then a code 90 is output. If cylinder number 3 had failed the first level and passed the second, then cylinder number 3 is considered to be weak. If cylinder number 3 again failed, the code 30 would be output again.

The test can be repeated a third time by depressing and releasing the throttle within two minutes of the last code output. This time the maximum rpm drop that results is multiplied by a still lower percentage. This number is now used as the minimum rpm drop for each cylinder to pass this test.

Example: 150 rpm x 20% = 30 rpm

If all the rpm drops are greater than 30 rpm then a code 90 is output. If cylinder number 3 had failed the first and second level, but passed the third, then it is considered to be a very weak cylinder. If cylinder number 3 failed the third level then a code 30 would again be output. In this case, cylinder number three would be considered a non-contributing cylinder.

(Continued)

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APPENDIX: Diagnostic Aids

The Cylinder Balance Test may still be repeated as many times as desired by depressing and releasing the throttle within two minutes of the last code output. All further testing (i.e. 4th, 5th pass) will be done using the third level percentage.

POSSIBLE CODE OUTPUTS (code 30 is used as an example only)

X = no further testing necessary

LEVEL				
1	2	3	INDICATION	POSSIBLE EEC CAUSES
90	X	X	Indicates a pass, all cylinders contributing equally.	
30	90	X	Indicates a weak cylinder. Cylinder is firing, but not contributing as much as the others.	• Partially clogged injector • Injector/harness resistance out of specification
30	30	90	Same as above, but more severe.	• Same as above, but more severe
30	30	30	Very weak or dead cylinder.	• Open or shorted circuit • Loss of injector drive signal • Fully clogged injector

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APPENDIX: Diagnostic Aids

FAILURE MODE EFFECTS MANAGEMENT (FMEM)

FMEM is an alternate system strategy in the ECA designed to allow improved vehicle drive should one or more sensor inputs fail.

When a sensor input is perceived to be out-of-limits by the ECA, an alternative strategy will be initiated.

The ECA will substitute a fixed in-limit sensor value and will continue to monitor the faulty sensor input. If the faulty sensor operates within limits, the ECA will return to the normal engine running strategy.

Engine Running Service Code 98 will be displayed when FMEM is in effect.

The "Check Engine" Light (MIL)/Message will remain on when FMEM is in effect.

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APPENDIX: Diagnostic Aids

"CHECK ENGINE" LIGHT (MALFUNCTION INDICATOR LIGHT) ALL APPLICATIONS EXCEPT CONTINENTAL

The "Check Engine" light is intended to alert the driver of certain malfunctions in the EEC-IV system. If the light is on, the driver of the vehicle should take the car in for service as soon as possible.

NOTE: It is not necessary to immediately turn the engine off and have the vehicle towed when the "Check Engine" light comes on.

The "Check Engine" light will come on while the engine is operating in Failure Mode Effects Management (FMEM) or Hardware Limited Operation Strategy (HLOS) modes. The light will stay on as long as the fault causing it is present.

In FMEM mode, the processor is receiving a sensor signal that is outside the limits set by the calibration strategy. In this mode the processor uses an alternate engine control strategy to maintain reasonable vehicle operation in spite of the fault. Below is a list of system faults which will turn on the "Check Engine" light in this mode. The error code associated with this fault is stored in Keep Alive Memory (KAM). If the fault is no longer present, the light will turn off and the vehicle will return to the normal vehicle strategy. The error code stored when the light was on is not erased. This code is one of the Continuous Memory codes, and it can be accessed by running the Key On Engine Off Self-Test.

HLOS mode is used when the system fault(s) is too extreme for the FMEM mode to handle. In HLOS mode, all software operations have stopped and the processor is running on hardware control only. The default strategy for this mode has a minimal calibration strictly to allow the vehicle to operate until it can be serviced.

NOTE: In HLOS mode Self-Test codes will not be output.

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APPENDIX: Diagnostic Aids

HOW THE "CHECK ENGINE" LIGHT OPERATES

System OK

The "Check Engine" light is turned on as a bulb check when the ignition key is first turned on. The EEC-IV processor turns the bulb off as soon as it receives the PIP (cranking) signal.

System Not OK

If the "Check Engine" light should remain on after the vehicle has started, run Quick Test and service any codes. If Self-Test has pass codes, the "Check Engine" light is always on and the vehicle has no drive symptoms, go to Quick Test Step 7.0.

If the "Check Engine" light never comes on, go to Quick Test Step 7.0.

If the vehicle is a no start, go to Pinpoint Test Step **A1**.

The following can activate the "Check Engine" light:

"CHECK ENGINE" Light System Fault(s)		Continuous Memory Codes
ECT	Engine Coolant Temperature	51, 61
ACT	Air Charge Temperature	54, 64
BP	Barometric Pressure	22
MAP	Manifold Absolute Pressure	22
VAF	Vane Air Flow	56, 66
MAF	Mass Air Flow	56, 66
EGO, HEGO	Exhaust Gas O_2	41, 42, 91
PFE	Pressure Feedback EGR	31, 35
EVP	EGR Valve Position	31, 35
TP	Throttle Position	53, 63
ITS	Idle Tracking Switch	71
IDM (DPDIS)	Ignition Diagnostic Monitor	18, 28, 48, 88
IDM (DIS)	Ignition Diagnostic Monitor	45, 46, 48
VAT	Vane Air Temperature	58, 68
If D.C. motor does not follow dashpot profile		13

NOTE: When in Self-Test the "Check Engine" light is not limited to Continuous Memory Codes and will also flash the service codes.

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APPENDIX: Diagnostic Aids

"CHECK ENGINE"/"CHECK DCL" MESSAGE (DATA COMMUNICATIONS LINK)

Continental Applications Only

The EEC-IV processor transmits the "Check Engine" message to the message center through the Data Communications Link (DCL). The message center is used to display the "Check Engine" and/or "Check DCL" messages.

HOW THE "CHECK ENGINE" MESSAGE OPERATES

Service Codes: Service codes can be digitally displayed on the message center when running Self-Test. (See Appendix: Self-Test)

The "Check Engine" message is activated when the EEC-IV processor switches to an alternate strategy of operation. This process is called Failure Mode Effects Management (FMEM). The "Check Engine" message is intended to alert the driver of certain malfunctions in the engine control system.

FMEM Mode: The "Check Engine" message is displayed and accompanied by a one second tone every five seconds. The tone is suppressed after one minute.

The "Check Engine" message will also be activated during an EEC-IV processor Hardware Limited Operating Strategy (HLOS) mode.

HLOS/DCL Failure: The "Check Engine" message will be displayed as described in FMEM. In addition, the message "Check DCL" will also be displayed.

If the "Check Engine" and/or "Check DCL" message should come on after the vehicle has started, RUN Key On Engine Off Self-Test to completion. If the message continues to remain on, go to Quick Test Step 7.0.

If the vehicle is a no start, go to Pinpoint Test Step $\boxed{\textbf{A1}}$.

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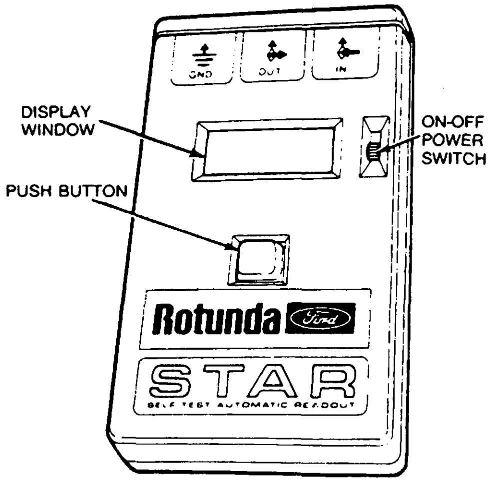
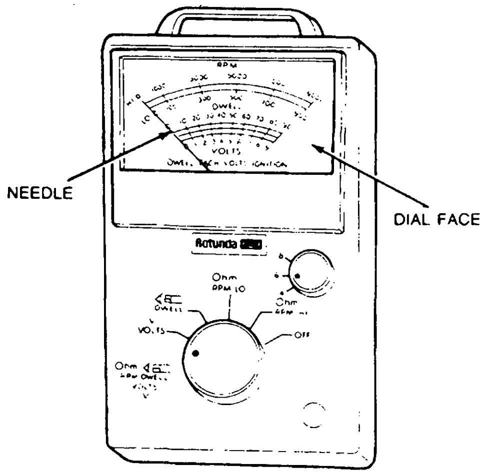
APPENDIX: Test Equipment

EQUIPMENT REQUIRED:

- Self-Test Automatic Readout (STAR), Rotunda No. 007-00004 with cable assembly No. 007-00010. Refer to STAR Tester operation.
- Analog volt-ohmmeter, 0 to 20V DC, (alternate to STAR).

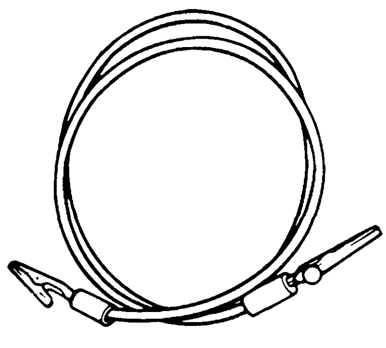


AUTOMATIC READOUT (STAR) TESTER
A11519-A

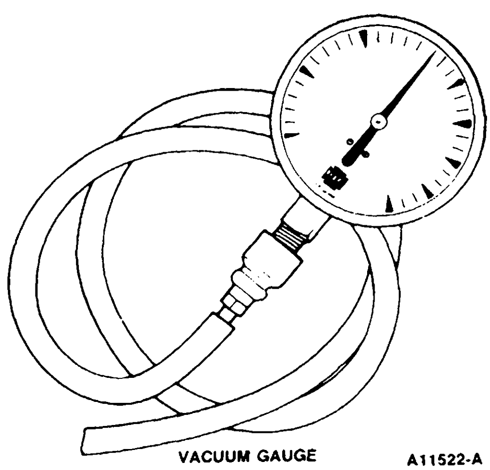


ANALOG VOLTMETER A11521-A

- Jumper wire.
- Vacuum gauge, Rotunda 059-00008 or equivalent. Range 0-30 in.-Hg. Resolution 1 in.-Hg.



JUMPER WIRE
A11520-A



VACUUM GAUGE A11522-A

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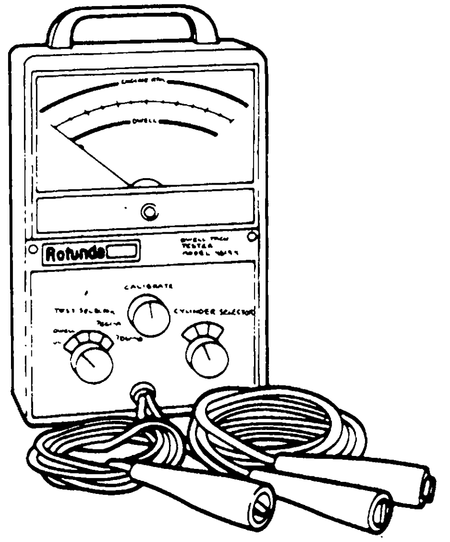
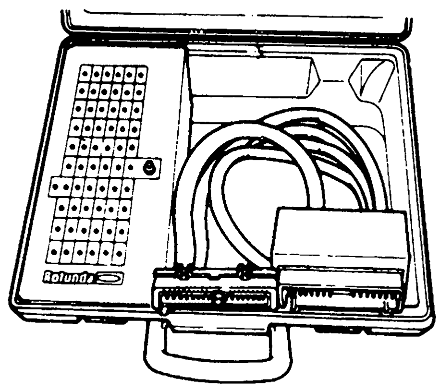
APPENDIX: Test Equipment (Continued)

- Tachometer, Rotunda No. 059-00010 or equivalent. Range 0-6,000 rpm. Accuracy ± 40 rpm. Resolution 20 rpm.
- Breakout Box, Rotunda 014-00322, Special Service Tool T83L-50-EEC-IV or equivalent.



TACHOMETER

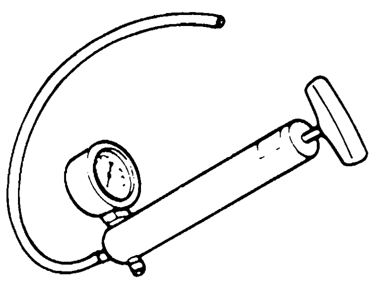
A11523-A



BREAKOUT BOX

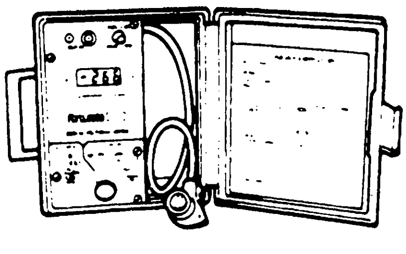
A11525-A

- Vacuum pump, Rotunda No. 021-00014 or equivalent. Range 0-30 in. Hg.
- Digital volt-ohmmeter, Rotunda No. 014-00407 or equivalent. Input impedance 10 Megaohm minimum.



VACUUM PUMP

A11524-A



DIGITAL VOLT-OHMMETER

A11526-A

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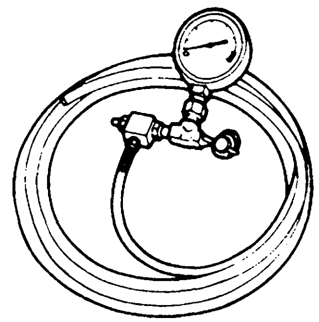
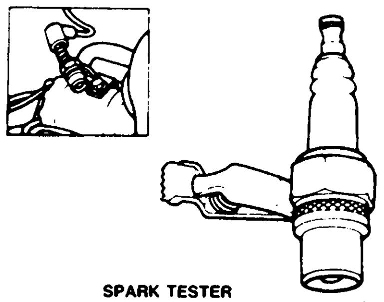
APPENDIX: Test Equipment (Continued)

- Electronic Fuel Injection Pressure Gauge EFI/CFI only, Tool T80L-9974-A or equivalent. (Use instructions. For specific applications, refer to Shop Manual, Group 24.)
- Spark tester (optional modified spark plug with side electrode removed). Tool D81P-6666-A or equivalent.

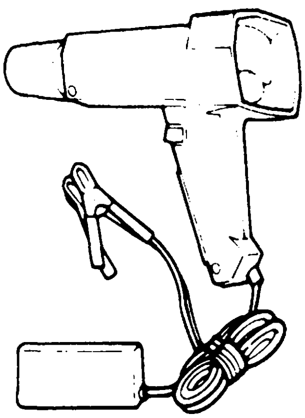


EFI PRESSURE GAUGE A11527-A

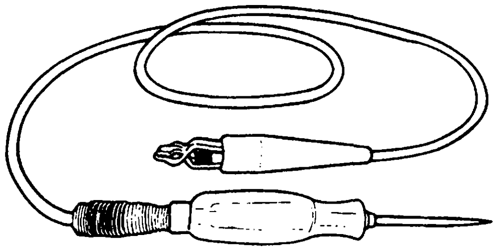


SPARK TESTER A11529-A

- Timing light, Rotunda model 059-00006 or equivalent.
- Non-powered test lamp.



TIMING LIGHT A11528-A



NON-POWERED TEST-LAMP A11530-A

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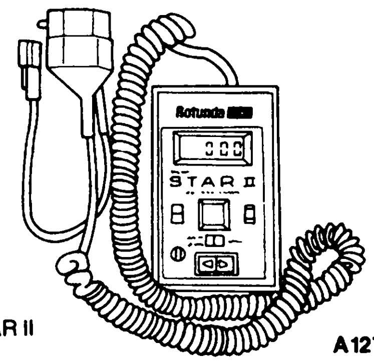
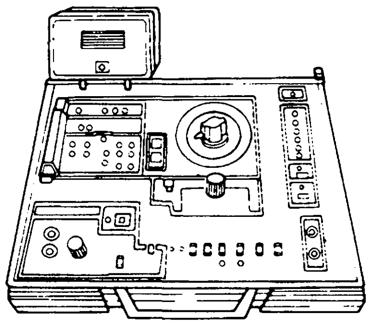
APPENDIX: Test Equipment (Continued)

OPTIONAL EQUIPMENT

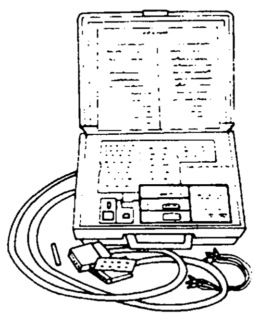
- SUPER Self-Test Automatic Readout II, (SUPER STAR II), Rotunda No. 007-00028.
- EEC-IV Monitor Box, Rotunda No. 007-00018.



SUPER STAR II A12793-A


EEC-IV MONITOR BOX A12794-A

- EEC-IV Monitor Recorder, Rotunda No. 007-00021.


EEC-IV MONITOR RECORDER A12795-A

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SECTION 15

EEC-IV—Engine Supplement—Passenger Car

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SECTION 15

EEC-IV—Engine Supplement—Passenger Car

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SECTION 15

EEC-IV—Engine Supplement—Passenger Car

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Diagnostic Sensor/Actuator Reference Values

Car

NOTES:

- The chart below contains typical component values.
- Values measured in the field may differ slightly from those shown.
- Do not compare reference values found on this chart with monitor-box data. Monitor-box data is measured with respect to a different reference level in some cases.
- Breakout box pin number assignments differ from vehicle to vehicle. Refer to the Pin Usage Chart applicable to the vehicle being serviced for the correct pin assignments.
- Each vehicle application will not have all components listed below.

Pre-condition the engine in the following manner before recording any observations:

— The engine should be at a normal operating condition.

— Start and run engine at 2000 rpm for two minutes.

	INPUTS	Breakout Box Pin Numbers (+)	(-)	Key Off Throttle Closed (ohms)	Key On Eng. Off (volts)	Hot Idle (volts)
*	Engine Coolant Temperature (ECT) ①	7	46	3.6 K to 1.7 K	—	0.74 to 0.31
	Throttle Position (TP)	47	46	0.5 K to 1.2 K	0.7 to 1.3	0.7 to 1.3
	Pressure Feedback EGR (PFE)	27	46	—	3.0 to 3.5	3.0 to 3.5
	EGR Valve Position (EVP)	27	46	480 to 650	0.30 to 0.45	0.30 to 0.45
*	Power Steering Pressure Switch (PSPS) ②	24	46	—	—	—
	(Heated) Exhaust Gas Oxygen (H)EGO	29	46	>1.5 M	<0.4	0.0 to 0.9
	Coil Tach Signal (IDM)	4	16	21.8 K	8.0 to 10.0	8.0 to 12.0
*	Distributor Position (PIP) ③	56	16	1.1 K to 2.1 K	—	3.0 to 7.0
*	Neutral/Drive Switch (NDS) ④	30	40	—	—	—
*	Clutch Engage Switch (CES) ⑤	30	40	—	—	—
	Reference Voltage (VREF)	26	46	—	5.0	5.0
*	Vehicle Speed Sensor (VSS) ⑥	3	6	190.0 to 240.0	—	—
*	Knock Sensor (KS) ⑦	23	46	4.5 K to 6.5 K	—	—
*	Manifold Pressure (MAP) Barometric Pressure (BP) ⑧	45	46	—	—	—
	OUTPUTS					
	Idle Speed Motor (ISC)	37	21	10.3	0.0 (OFF)	3.0 to 5.0
	Fuel Pump Relay (FP)	37	22	—	0.0 (OFF)	VBAT (ON)
*	Injectors Bank #1 ⑨	37	58	—	0.0	—
*	Injectors Bank #2 ⑨	37	59	—	0.0	—
	Computed Spark Advance (DIS)	36	16	—	9.0 to 12.5	8.5 to 9.5
	Computed Spark Advance (TFI)	36	16	—	0.0	5.0 to 7.0
	EGR Valve Regulator (EVR)	37	33	40.0 to 50.0	0.0 (OFF)	0.0 (OFF)

*** Numbers to the right of these inputs/outputs refer to explanations on next page.**

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Diagnostic Sensor/Actuator Reference Values

Car

Explanations —

1. Engine coolant temperature must be within the 180-240°F (82-116°C) temperature range before measurements are taken.

2. If power steering pressure rises above a specified limit, the switch contacts will open and the ECA will adjust idle speed to compensate for the extra load placed on the engine.

3. For applications containing TFI-IV systems only.

4. The NDS is open in any gear, but closed in neutral or park.

5. If the clutch pedal is down, the switch is closed.
If the clutch pedal is up, the switch is open.

6. If vehicle is not moving, the speed sensor output to the processor will be zero. The vehicle must be moving for the speed sensor to provide information to the processor.

7. The Knock Sensor output voltage is a variable signal of 300 mV or greater, depending on the severity of engine knock; background noise is not part of the sensor output.

8. Refer to the Altitude vs. Voltage Chart in Pinpoint Test DF, Section 17 for proper operating values.

9. Refer to the Injector Resistance Chart in Pinpoint Test H, Section 17 for the proper resistance values.

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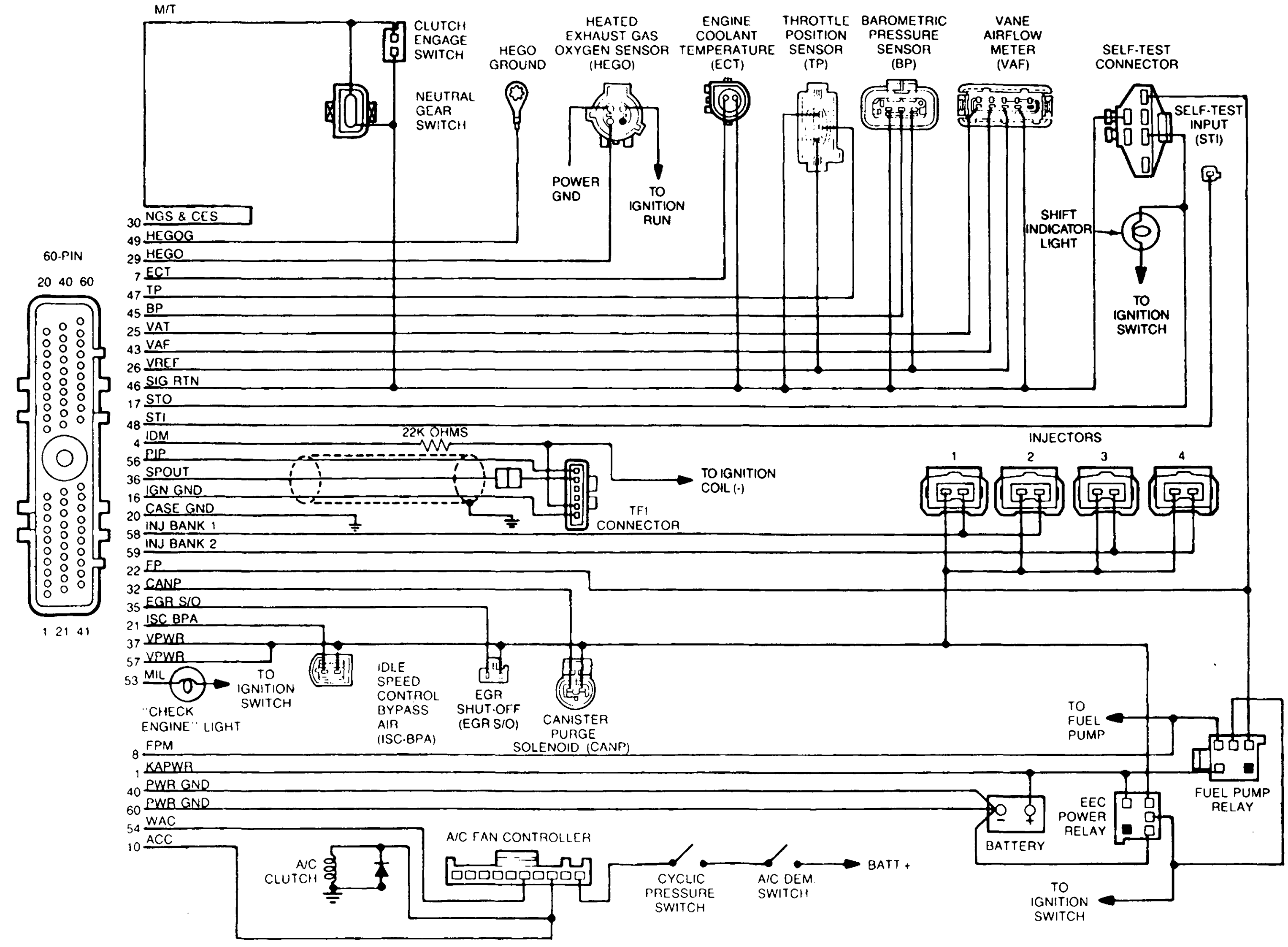
Electrical Schematic

1.9L EFI



NOTE: WIRING SCHEMATIC SHOWS PIN OUT LOOKING INTO HARNESS CONNECTORS

A8945-D

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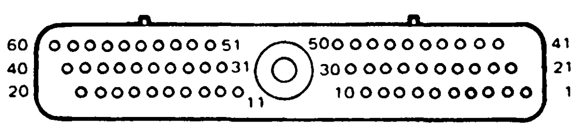
EEC-IV Module Connector Pin Usage

1.9L EFI

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
7	354	LG/Y	Engine Coolant Temperature	ECT
8	787	PK/BK	Fuel Pump Monitor	FPM
10	347	BK/Y	A/C Clutch Compressor	ACC
16	259	BK/O	Ignition Ground	IGN GND
17	224	T/LB	Self-Test Output and Shift Indicator Light	STO and SIL
20	57	BK	Case Ground	CSE GND
21	68	O/BK	Idle Speed Control (Bypass Air)	ISC-BPA
22	97	T/LG	Fuel Pump	FP
25	357	LG/P	Vane Air Temperature	VAT
26	351	O/W	Reference Voltage	VREF
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	614	GY/O	Neutral Drive Gear Switch and Clutch Engage Switch	NDS and CES
32	101	GY/Y	Canister Purge Solenoid	CANP
35	362	Y	Exhaust Gas Recirculation Shut Off	EGR S/O
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
40	60	BK/LG	Power Ground	PWR GND
43	200	W/BK	Vane Air Flow	VAF
45	358	LG/BK	Barometric Pressure	BP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Ground	HEGOG
53	201	T/R	"Check Engine" Light	MIL
54	73	O/LB	Wide Open Throttle A/C Cut-Off	WAC
56	349	DB	Profile Ignition Pickup	PIP
57	361	R	Vehicle Power	VPWR
58	95	T/R	Injector Bank 1	INJ Bank 1
59	96	T/O	Injector Bank 2	INJ Bank 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definitions

1.9L EFI

SERVICE CODE		SERVICE CODE DEFINITION
11	orc ▶	System PASS
12	r ▶	Rpm unable to achieve Self-Test upper limit
13	r ▶	Rpm unable to achieve Self-Test lower limit
14	c ▶	PIP circuit failure
15	o ▶	ROM test failure
15	c ▶	Power interruption to Keep Alive Memory (KAM)
16	r ▶	Rpm above Self-Test limit with ISC off
17	r ▶	Rpm below Self-Test limit with ISC off
18	r ▶	SPOUT circuit open
18	c ▶	Loss of tach input to Processor/SPOUT circuit grounded
19	r ▶	Rpm dropped too low during ISC off test
21	or ▶	ECT sensor input is out of Self-Test range
22	orc ▶	BP sensor input is out of Self-Test range
23	or ▶	TP sensor input is out of Self-Test range
26	or ▶	VAF sensor input is out of Self-Test range
28	or ▶	VAT sensor input is out of Self-Test range
41	r ▶	HEGO sensor circuit indicates system lean
41	c ▶	No HEGO switching detected — always lean
42	r ▶	HEGO sensor circuit indicates system rich
42	c ▶	No HEGO switching detected — always rich
43	c ▶	HEGO lean at wide open throttle
47	r ▶	Measured airflow low at base idle
48	r ▶	Measured airflow high at base idle
51	oc ▶	ECT sensor input is greater than Self-Test maximum
53	oc ▶	TP sensor input is greater than Self-Test maximum
56	oc ▶	VAF sensor input is greater than Self-Test maximum
58	oc ▶	VAT sensor input is greater than Self-Test maximum
61	oc ▶	ECT sensor input is less than Self-Test minimum
63	oc ▶	TP sensor input is less than Self-Test minimum
65	c ▶	Never went to closed loop fuel
66	oc ▶	VAF sensor input is less than Self-Test minimum
67	o ▶	Neutral Drive Switch (NDS) circuit open; A/C input high
67	c ▶	Clutch switch circuit failure
68	oc ▶	VAT sensor input is less than Self-Test minimum
71	c ▶	Software reinitialization detected
72	c ▶	Power interrupt detected
73	r ▶	Insufficient TP output change during Dynamic Response Test
76	r ▶	Insufficient VAF output change during Dynamic Response Test
77	r ▶	Brief WOT not sensed during Self-Test/Operator error
85	c ▶	Adaptive fuel lean limit reached
86	c ▶	Adaptive fuel rich limit reached
95	oc ▶	Fuel pump secondary circuit failure
96	oc ▶	Fuel pump secondary circuit failure
NO CODES	▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED	▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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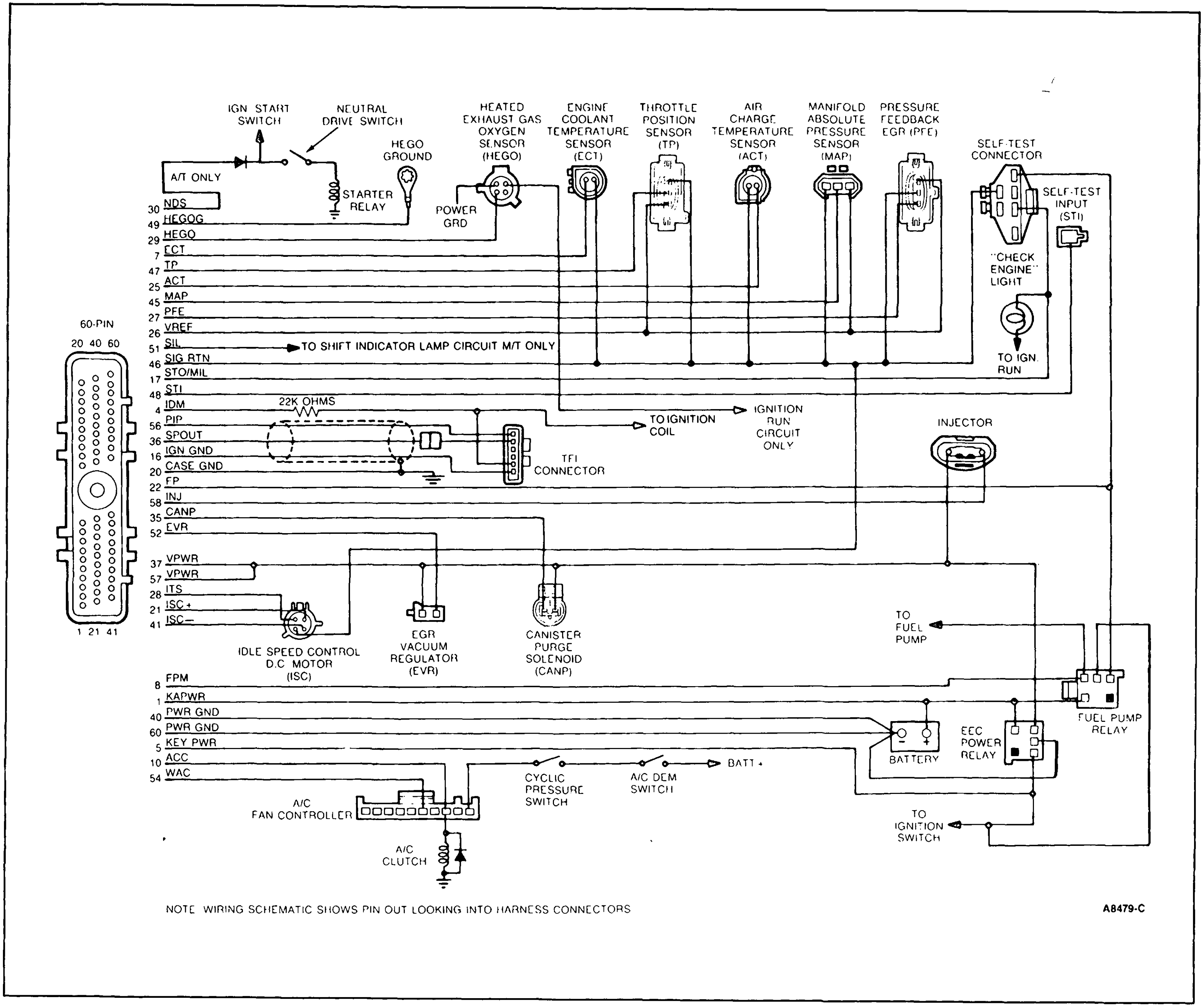
Electrical Schematic

1.9L CFI



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1.9L CFI

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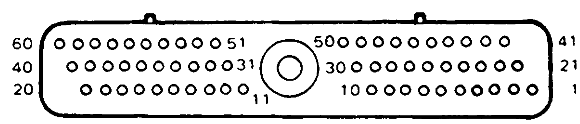
8	787	PK/BK	Fuel Pump Monitor	FPM
10	347	BK/Y	A/C Clutch Compressor	ACC
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output/"Check Engine" Light	STO/MIL
20	57	BK	Case Ground	CSE GND
21	376	BR/W	Idle Speed Control (DC Motor)	ISC +
22	97	T/LG	Fuel Pump Relay	FP
25	357	LG/P	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	Pressure Feedback EGR	PFE
28	265	LG/W	Idle Tracking Switch	ITS
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	614	GY/O	Neutral Drive Switch (A/T Only)	NDS
35	101	GY/Y	Canister Purge Solenoid	CANP
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
40	60	BK/LG	Power Ground	PWR GND
41	264	W/LB	Idle Speed Control (DC Motor)	ISC –
45	358	LG/BK	Manifold Absolute Pressure Sensor	MAP
46	359	BK/W	Signal Return (Ground)	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Ground	HEGOG
51	224	T/LB	Shift Indicator Light (M/T Only)	SIL
52	362	Y	EGR Vacuum Regulator Solenoid	EVR
54	73	O/LB	WOT A/C Cut Off	WAC
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	95	T/R	Fuel Injector	INJ
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definitions

1.9L CFI

SERVICE CODE			SERVICE CODE DEFINITION
11	orc	▶	System PASS
12	r	▶	Rpm below Self-Test limit
13	o	▶	D.C. motor did not move
13	r	▶	Rpm above Self-Test limit
13	c	▶	D.C. motor did not follow dashpot
14	c	▶	PIP circuit failure
15	o	▶	ROM test failure
15	c	▶	Power interruption to Keep Alive Memory (KAM)
16	r	▶	Idle hard set high
17	r	▶	Idle hard set low
18	r	▶	SPOUT circuit open
18	c	▶	Loss of tach input to Processor/SPOUT circuit grounded
19	r	▶	Erratic rpm during hard idle set test
21	or	▶	ECT sensor input is out of Self-Test range
22	orc	▶	MAP sensor input is out of Self-Test range
23	orc	▶	TP sensor input is out of Self-Test range
24	or	▶	ACT sensor input is out of Self-Test range
31	orc	▶	PFE circuit is below minimum voltage
32	rc	▶	EGR valve not seated
33	rc	▶	EGR valve is not opening (PFE)
34	o	▶	Defective PFE sensor
34	rc	▶	Excessive exhaust back pressure
35	orc	▶	PFE circuit is above maximum voltage
38	c	▶	Idle Tracking Switch (ITS) circuit open
41	r	▶	HEGO sensor circuit indicates system lean
41	c	▶	No HEGO switching detected
42	r	▶	HEGO sensor circuit indicates system rich
51	oc	▶	ECT sensor input is greater than Self-Test maximum
53	oc	▶	TP sensor input is greater than Self-Test maximum
54	oc	▶	ACT sensor input is greater than Self-Test maximum
55	r	▶	Keypower input to processor is open
58	o	▶	Idle Tracking Switch (ITS) circuit open
58	r	▶	Idle Tracking Switch (ITS) closed
61	oc	▶	ECT sensor input is less than Self-Test minimum
63	oc	▶	TP sensor input is less than Self-Test minimum
64	oc	▶	ACT sensor input is less than Self-Test minimum
67	or	▶	Neutral Drive Switch (NDS) circuit open; A/C input high
68	o	▶	Idle Tracking Switch (ITS) closed
68	r	▶	Idle Tracking Switch (ITS) circuit open
71	c	▶	Idle Tracking Switch (ITS) closed on pre-position
73	o	▶	Insufficient throttle position change
84	or	▶	EGR Vacuum Regulator (EVR) circuit failure
85	or	▶	Canister Purge (CANP) circuit failure
87	orc	▶	Fuel pump primary circuit failure
93	o	▶	TP sensor input low at maximum D.C. motor extension
95	oc	▶	Fuel pump secondary circuit failure
96	oc	▶	Fuel pump secondary circuit failure
98	r	▶	Hard fault is present
99	r	▶	EEC system has not learned to control idle
NO CODES		▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED		▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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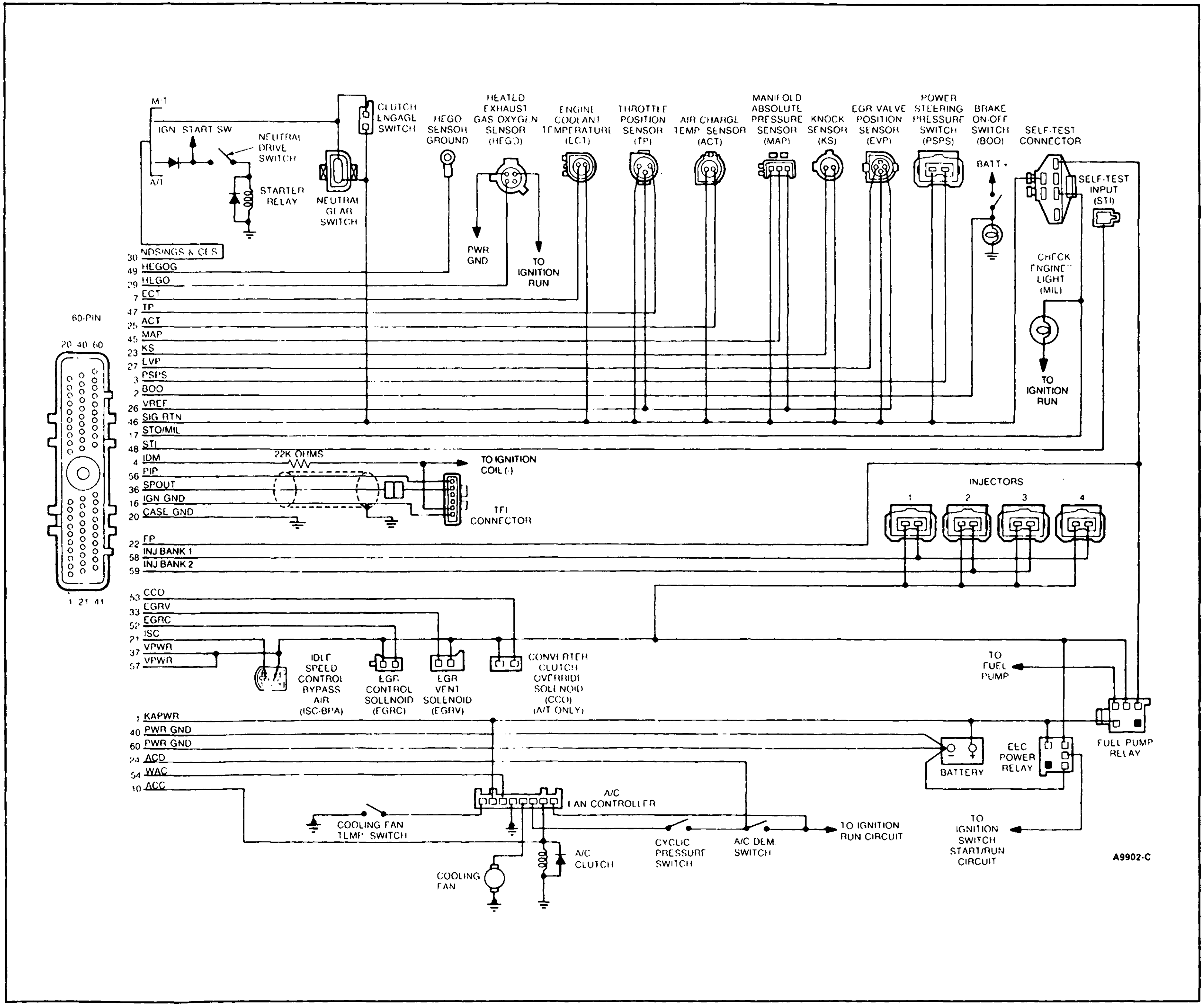
Electrical Schematic

2.3L OHC EFI



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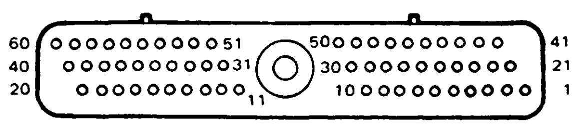
EEC-IV Module Connector Pin Usage

2.3L OHC EFI

MUSTANG

Pin	Circuit	Wire Color	Application	Abbreviations
1	38	BK/O	Keep Alive Power	KAPWR
2	810	R/LG	Brake On/Off	BOO
3	330	Y/LG	Power Steering Pressure Switch	PSPS
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
7	354	LG/Y	Engine Coolant Temperature	ECT
10	347	BK/Y	A/C Clutch Compressor	ACC
16	259	BK/O	Ignition Ground	IGN GND
17	657	T	Self-Test Output/"CHECK ENGINE" Light	STO/MIL
20	57	BK	Case Ground	CSE GND
21	264	W/LB	Idle Speed Control — Bypass Air	ISC — BPA
22	97	T/LG	Fuel Pump	FP
23	310	Y/R	Knock Sensor	KS
24	348	LG/P	A/C Demand	ACD
25	162	LG/R	Air Charge Temperature	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position	EVP
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	771	P/Y	Neutral Drive Switch (A/T Only)	NDS
30	771	P/Y	Neutral Gear Switch and Clutch Engage Switch (M/T Only)	NGS & CES
33	360	DG	Exhaust Gas Recirculation Vent	EGRV
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
40	60	BK/LG	Power Ground	PWR GND
45	358	LG/BK	Manifold Absolute Pressure Sensor	MAP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	209	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Sensor Ground	HEGOG
52	362	Y	Exhaust Gas Recirculation Control	EGRC
53	237	O/Y	Clutch Converter Override (A/T Only)	CCO
54	73	O/LB	W.O.T. A/C Cut Off	WAC
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	96	T/O	Injector Bank 1	INJ Bank 1
59	95	T/R	Injector Bank 2	INJ Bank 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definitions

2.3L OHC EFI

SERVICE CODE		SERVICE CODE DEFINITION
11	orc ▶	System PASS
12	r ▶	Unable to control rpm to Self-Test upper limit band
13	r ▶	Unable to control rpm to Self-Test lower limit band
14	c ▶	PIP circuit failure
15	o ▶	ROM test failure
15	c ▶	Power interruption to Keep Alive Memory (KAM)
16	r ▶	Rpm too low to perform fuel test
18	c ▶	Loss of tach input to Processor/SPOUT circuit grounded
19	o ▶	Failure of EEC power supply
21	or ▶	ECT sensor input is out of Self-Test range
22	orc ▶	MAP sensor input is out of Self-Test range
23	or ▶	TP sensor input is out of Self-Test range
24	or ▶	ACT sensor input is out of Self-Test range
25	r ▶	KS sensor signal is not sensed in Dynamic Response Test
31	orc ▶	EVP circuit is below minimum voltage
32	r ▶	EGR not controlling
33	r ▶	EVP not closing in limits
34	r ▶	Insufficient EGR flow
35	r ▶	Rpm too low for EGR test
41	r ▶	HEGO sensor circuit indicates system lean
41	c ▶	No HEGO switching detected
42	r ▶	HEGO sensor circuit indicates system rich
51	oc ▶	ECT sensor input is greater than Self-Test maximum
52	o ▶	PSPS circuit is open
53	oc ▶	TP sensor input is greater than Self-Test maximum
54	oc ▶	ACT sensor input is greater than Self-Test maximum
61	oc ▶	ECT sensor input is less than Self-Test minimum
63	oc ▶	TP sensor input is less than Self-Test minimum
64	oc ▶	ACT sensor input is less than Self-Test minimum
67	o ▶	Neutral Drive Switch (NDS) circuit open; A/C input high
72	r ▶	Insufficient MAP output change during Dynamic Response Test
73	r ▶	Insufficient TP output change during Dynamic Response Test
74	r ▶	Brake On/Off (BOO) circuit open — not actuated during test
75	r ▶	Brake On/Off (BOO) circuit closed — always high
77	r ▶	Brief WOT not sensed during Self-Test/Operator error
83	o ▶	EGRC solenoid circuit failure
84	o ▶	EGRV solenoid circuit failure
87	o ▶	Fuel pump primary circuit failure
89	o ▶	Clutch Converter Override (CCO) circuit failure
98	r ▶	Hard fault is present
NO CODES	▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED	▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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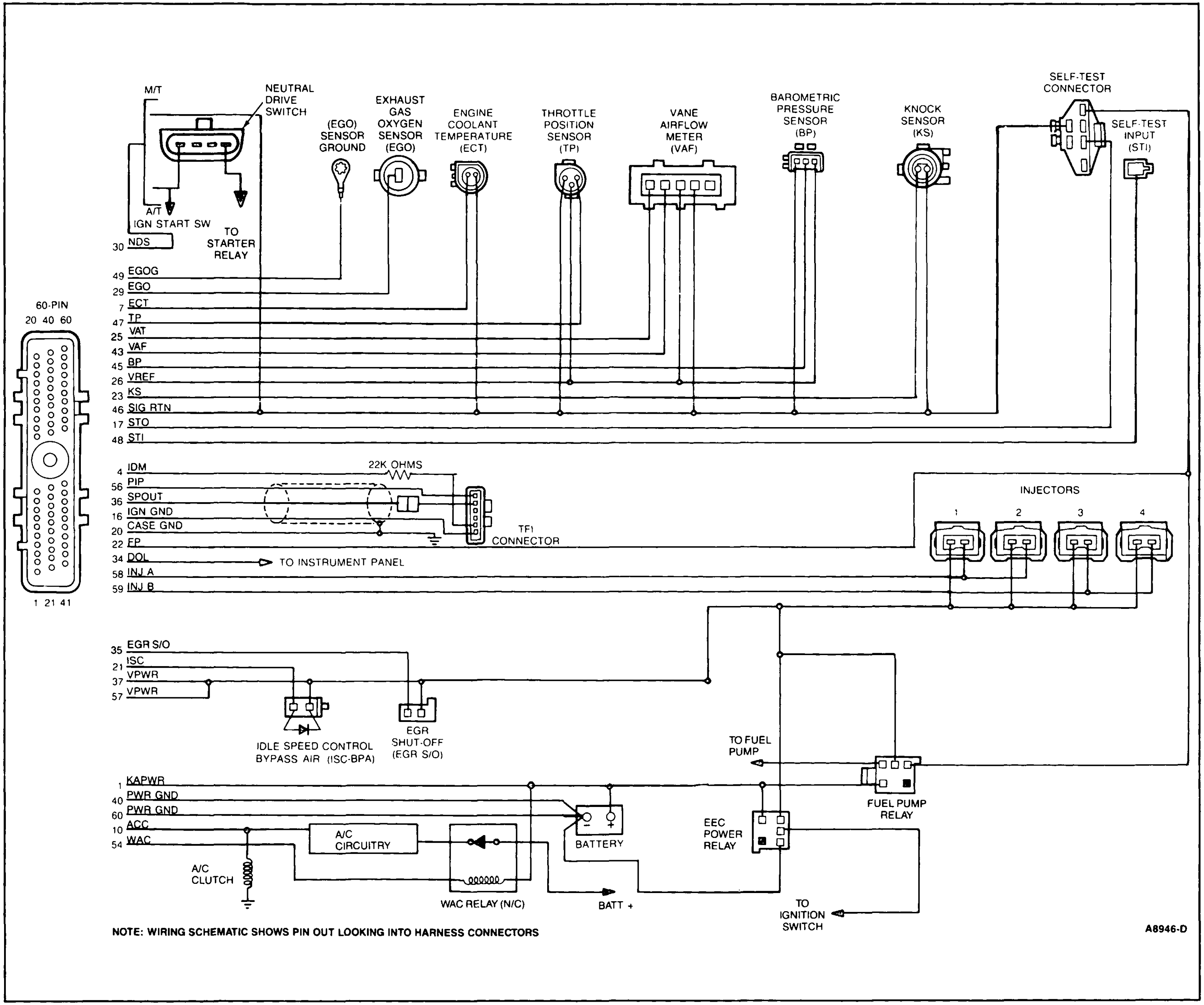
Electrical Schematic

2.3L TURBO EFI



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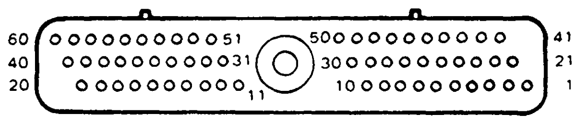
EEC-IV Module Connector Pin Usage

2.3L TURBO EFI

XR4TI MERKUR

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
7	354	LG/Y	Engine Coolant Temperature	ECT
10	347	BK/Y	A/C Clutch	ACC
16	259	BK/O	Ignition Ground	IGN GND
17	201	BK/O	Self-Test Output	STO
20	57	BK	Case Ground	CASE GND
21	67	GY/W	Idle Speed Control — Bypass Air	ISC-BPA
22	97	T/LG	Fuel Pump Control	FP
23	310	Y/R	Knock Sensor	KS
25	357	LG/P	Valve Air Temperature Sensor	VAT
26	351	O/W	Voltage Reference	VREF
29	94	DG/P	Exhaust Gas Oxygen Sensor	EGO
30	376	BR/W	Neutral Drive Switch (A/T Only)	NDS
30	359	BK/W	Neutral Input (M/T Only)	NI
34	305	LB/PK	Data Output Link	DOL
35	362	Y	Exhaust Gas Recirculation Shut Off	EGR S/O
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
40	57	BK/LG	Battery Ground	BATT GND
43	200	W/BK	Vane Air Flow	VAF
45	358	LG/BK	Barometric Pressure	BP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	209	W/R	Self-Test Input	STI
49	89	O	Exhaust Gas Oxygen Ground	EGOG
54	331	R	Wide Open Throttle A/C Cut-Off	WAC
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	555	T	Injector Bank 1	INJ Bank 1
59	557	BR/Y	Injector Bank 2	INJ Bank 2
60	60	BK/LG	Battery Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definitions

2.3L TURBO EFI

SERVICE CODE		SERVICE CODE DEFINITION
11	orc ▶	System PASS
12	r ▶	Unable to control rpm to Self-Test upper limit band
13	r ▶	Unable to control rpm to Self-Test lower limit band
14	c ▶	PIP circuit failure
15	o ▶	ROM test failure
15	c ▶	Power interruption to Keep Alive Memory (KAM)
18	c ▶	Loss of tach input to Processor/SPOUT circuit grounded
21	or ▶	ECT sensor input is out of Self-Test range
22	orc ▶	BP sensor input is out of Self-Test range
23	or ▶	TP sensor input is out of Self-Test range
24	or ▶	VAT sensor input is out of Self-Test range
25	r ▶	KS sensor signal is not sensed in Dynamic Response Test
26	or ▶	VAF sensor input is out of Self-Test range
34	r ▶	Insufficient EGR flow
41	r ▶	EGO sensor circuit indicates system lean
41	c ▶	No EGO switching detected — system always lean
42	r ▶	EGO sensor circuit indicates system rich
42	c ▶	No EGO switch detected — always rich
51	oc ▶	ECT sensor input is greater than Self-Test maximum
53	oc ▶	TP sensor input is greater than Self-Test maximum
54	oc ▶	VAT sensor input is greater than Self-Test maximum
61	oc ▶	ECT sensor input is less than Self-Test minimum
63	oc ▶	TP sensor input is less than Self-Test minimum
64	oc ▶	VAT sensor input is less than Self-Test minimum
66	oc ▶	VAF sensor input is less than Self-Test minimum
67	o ▶	Neutral Drive Switch (NDS) circuit open; A/C input high
67	c ▶	Clutch switch circuit failure
71	c ▶	Software reinitialization detected
72	c ▶	Power interrupt detected
73	r ▶	Insufficient TP output change during Dynamic Response Test
76	r ▶	Insufficient VAF output change during Dynamic Response Test
77	r ▶	Brief WOT not sensed during Self-Test/Operator error
NO CODES	▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED	▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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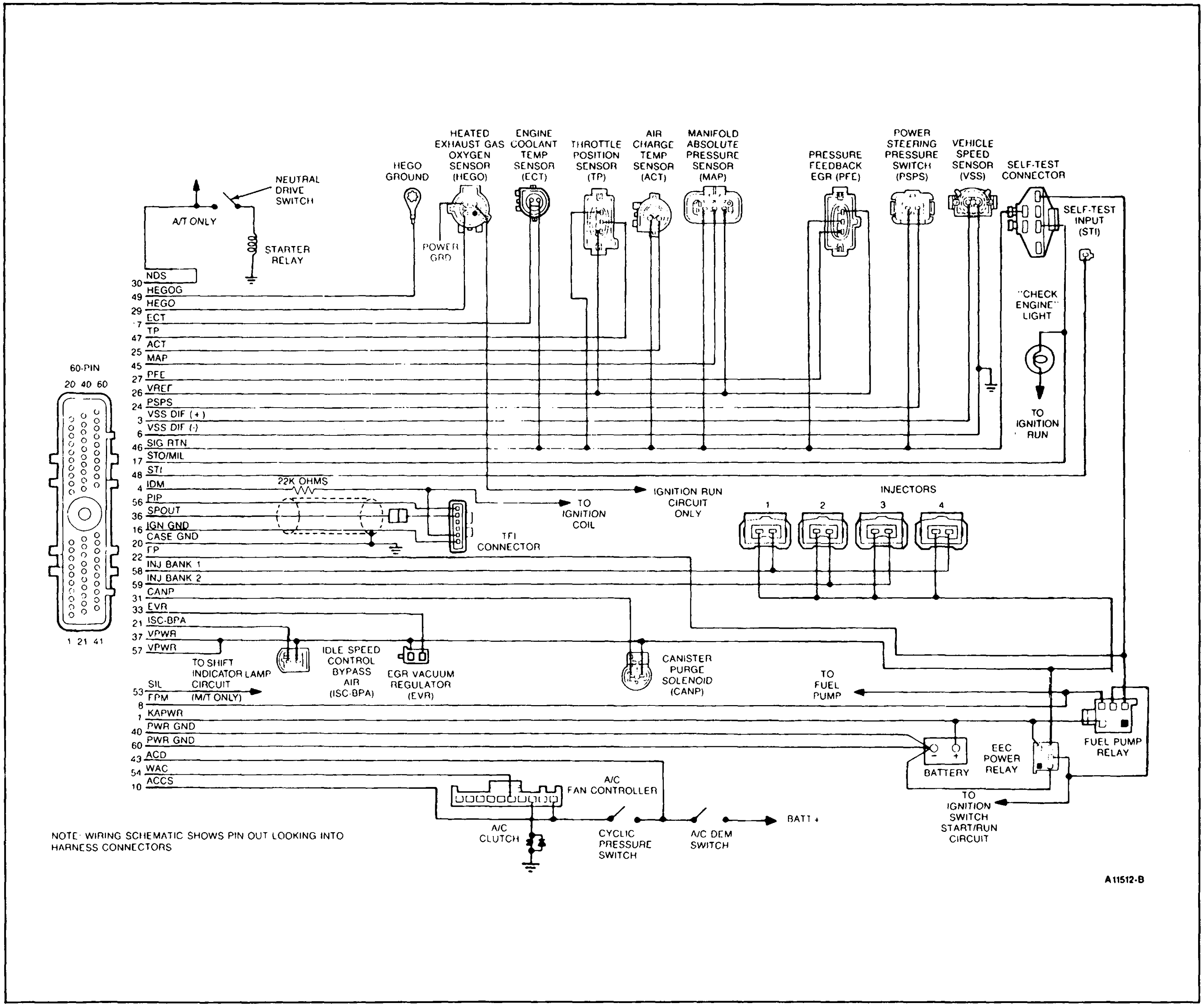
Electrical Schematic

2.3L HSC EFI



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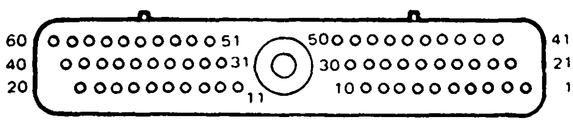
EEC-IV Module Connector Pin Usage

2.3L HSC EFI

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
3	150	DG/W	Vehicle Speed Sensor +	VSSDIF +
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
6	563	O/Y	Vehicle Speed Sensor	VSSDIF –
7	354	LG/Y	Engine Coolant Temperature Sensor	ECT
8	787	PK/BK	Fuel Pump Monitor	FPM
10	198	T/Y	A/C Cycling Switch	ACCS
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output/"Check Engine" Light	STO/MIL
20	57	BK	Case Ground	CASE GND
21	376	BR/W	Idle Speed Control — Bypass Air	ISC — BPA
22	238	O/LB	Fuel Pump Relay	FP
24	330	Y/LG	Power Steering Pressure Switch	PSPS
25	357	LG/P	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	Pressure Feedback EGR	PFE
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	614	GY/O	Neutral Drive Switch (A/T Only)	NDS
30	614	GY/O	Clutch Engage Switch	CES
31	101	GY/Y	Canister Purge Solenoid	CANP
33	362	Y	EGR Vacuum Regulator Solenoid	EVR
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
40	60	BK/LG	Power Ground	PWR GND
43	348	LG/P	A/C Demand	ACD
45	358	LG/BK	Manifold Absolute Pressure Sensor	MAP
46	359	BK/W	Signal Return Ground	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	209	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Ground	HEGOG
53	224	T/LB	Shift Indicator Light	SIL
54	73	O/LB	WOT A/C Cut Off	WAC
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	95	T/R	Injector Bank 1	INJ Bank 1
59	96	T/O	Injector Bank 2	INJ Bank 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definitions

2.3L HSC EFI

SERVICE CODE		SERVICE CODE DEFINITION
11 orc	▶	System PASS
12 r	▶	Unable to control rpm to Self-Test upper limit band
13 r	▶	Unable to control rpm to Self-Test lower limit band
14 c	▶	PIP circuit failure
15 o	▶	ROM test failure
15 c	▶	Power interruption to Keep Alive Memory (KAM)
18 r	▶	SPOUT circuit open
18 c	▶	Loss of tach input to Processor/SPOUT circuit grounded
19 o	▶	Failure of EEC power supply
21 or	▶	ECT sensor input is out of Self-Test range
22 orc	▶	MAP sensor input is out of Self-Test range
23 or	▶	TP sensor input is out of Self-Test range
24 or	▶	ACT sensor input is out of Self-Test range
29 c	▶	Insufficient input from the Vehicle Speed Sensor (VSS)
31 orc	▶	PFE circuit is below minimum voltage
32 rc	▶	EGR valve not seated
33 rc	▶	EGR valve is not opening (PFE)
34 o	▶	Defective PFE sensor
34 rc	▶	Excessive exhaust back pressure
35 orc	▶	PFE circuit is above maximum voltage
41 r	▶	HEGO sensor circuit indicates system lean
41 c	▶	No HEGO switching detected
42 r	▶	HEGO sensor circuit indicates system rich
51 oc	▶	ECT sensor input is greater than Self-Test maximum
52 o	▶	PSPS circuit is open
52 r	▶	PSPS always staying open or closed
53 oc	▶	TP sensor input is greater than Self-Test maximum
54 oc	▶	ACT sensor input is greater than Self-Test maximum
61 oc	▶	ECT sensor input is less than Self-Test minimum
63 oc	▶	TP sensor input is less than Self-Test minimum
64 oc	▶	ACT sensor input is less than Self-Test minimum
67 o	▶	Neutral Drive Switch (NDS) circuit open; A/C input high
72 r	▶	Insufficient MAP output change during Dynamic Response Test
73 r	▶	Insufficient TP output change during Dynamic Response Test
77 r	▶	Brief WOT not sensed during Self-Test/Operator error
84 o	▶	EGR Vacuum Regulator (EVR) circuit failure
85 o	▶	Canister Purge (CANP) circuit failure
87 oc	▶	Fuel pump primary circuit failure
95 oc	▶	Fuel pump secondary circuit failure
96 oc	▶	Fuel pump secondary circuit failure
98 r	▶	Hard fault is present
NO CODES	▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED	▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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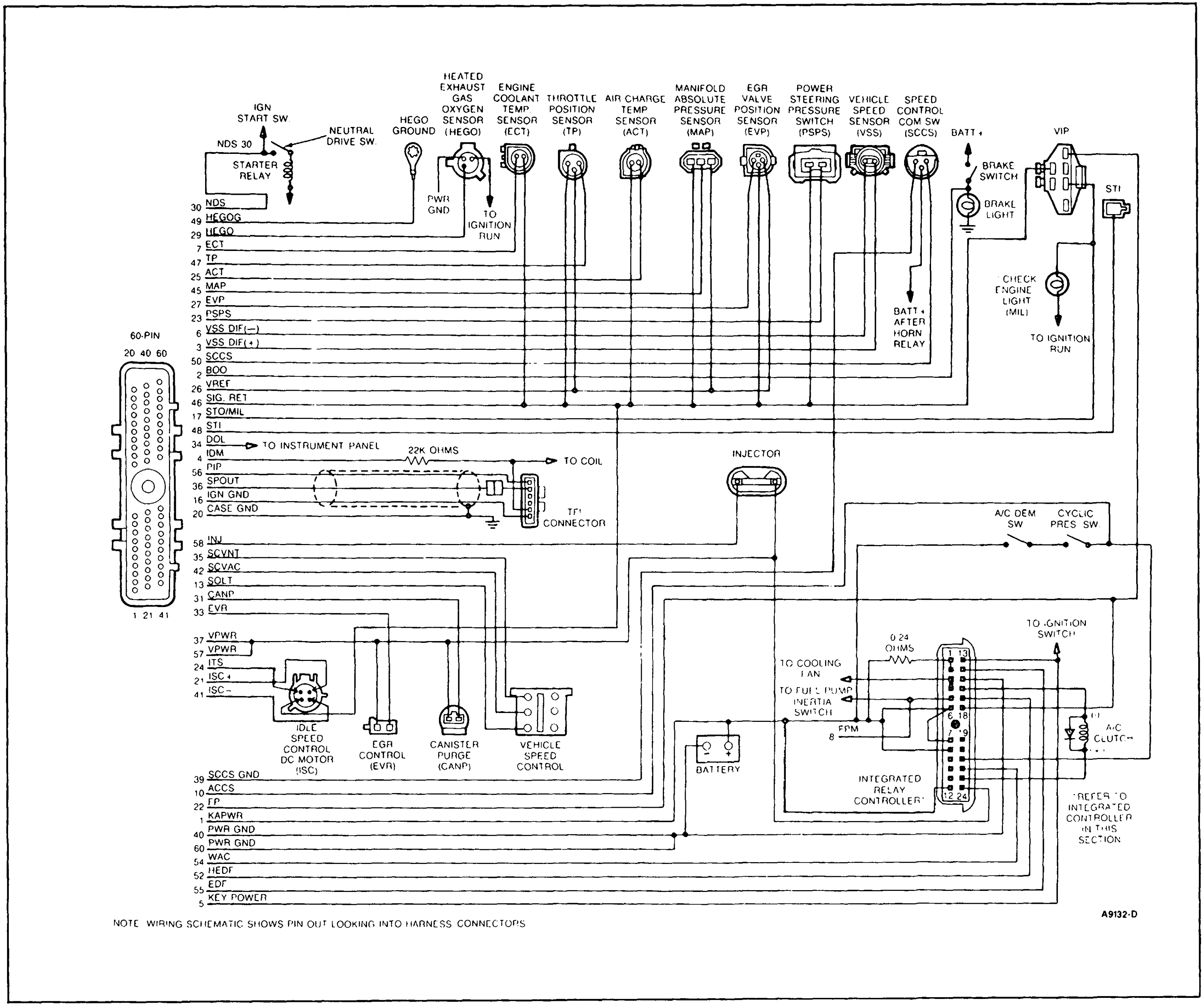

NOTE: WIRING SCHEMATIC SHOWS PIN OUT LOOKING INTO HARNESS CONNECTORS

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EEC-IV Module Connector Pin Usage

2.5L CLC CFI

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
2	810	R/LG	Brake On/Off	BOO
3	150	DG/W	Vehicle Speed Sensor +	VSS +
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
5	16	R/LG	Key Power	KPWR
6	563	O/Y	Vehicle Speed Sensor –	VSS –
7	354	LG/Y	Engine Coolant Temperature	ECT
8	787	PK/BK	Fuel Pump Monitor	FPM
10	883	PK/LB	A/C Cycling Switch	ACCS
13	144	O/Y	Vehicle Speed Control Solenoid	SOL +
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Out/"Check Engine" Light	STO/MIL
20	57	BK	Case Ground	CSE GND
21	382	Y/BK	Idle Speed Control (DC Motor)	ISC +
22	97	T/LG	Fuel Pump	FP
23	330	Y/LG	Power Steering Pressure Switch	PSPS
24	209	W/R	Idle Tracking Switch	ITS
25	357	LG/P	Air Charge Temperature	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position	EVP
29	94	DG/P	Heated Exhaust Gas Oxygen (Sensor)	HEGO
30	199	LB/Y	Neutral Drive Switch	NDS
31	101	GY/Y	Canister Purge Solenoid	CANP
33	360	DG	EGR Vacuum Regulator (Solenoid)	EVR
34	305	LB/PK	Data Output Link	DOL
35	146	W/PK	Speed Control Vent (Solenoid)	SCVNT
36	324	Y/LG	Spark Out	SPOUT
37	361	R	Vehicle Power	VPWR
39	461	O	Speed Control Command Switch Ground	SCCS GND

(Continued)

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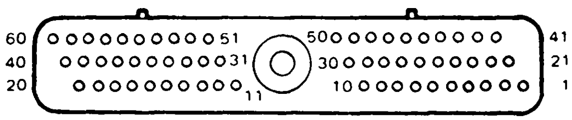
EEC-IV Module Connector Pin Usage

2.5L CLC CFI

Pin	Circuit	Wire Color	Application	Abbreviations
40	60	BK/LG	Power Ground	PWR GND
41	377	W	Idle Speed Control — (DC Motor)	ISC -
42	145	GY/BK	Speed Control Vacuum (Solenoid)	SCVAC
45	358	LG/BK	Manifold Absolute Pressure (Sensor)	MAP
46	359	BK/W	Signal Return (Ground)	SIG RTN
47	355	DG/LG	Throttle Position (Sensor)	TP
48	200	W/BK	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen (Sensor) Ground	HEGO GND
50	151	LB/BK	Speed Control Command Switch	SCCS
52	639	PK	High Electro Drive Fan	HEDF
54	331	R	Wide Open Throttle (WOT) A/C Cut Off	WAC
55	197	T/O	Electro Drive Fan (Low)	EDF
56	349	DB	Profile Ignition Pick-up	PIP
57	361	R	Vehicle Power	VPWR
58	95	T/R	Injector	INJ
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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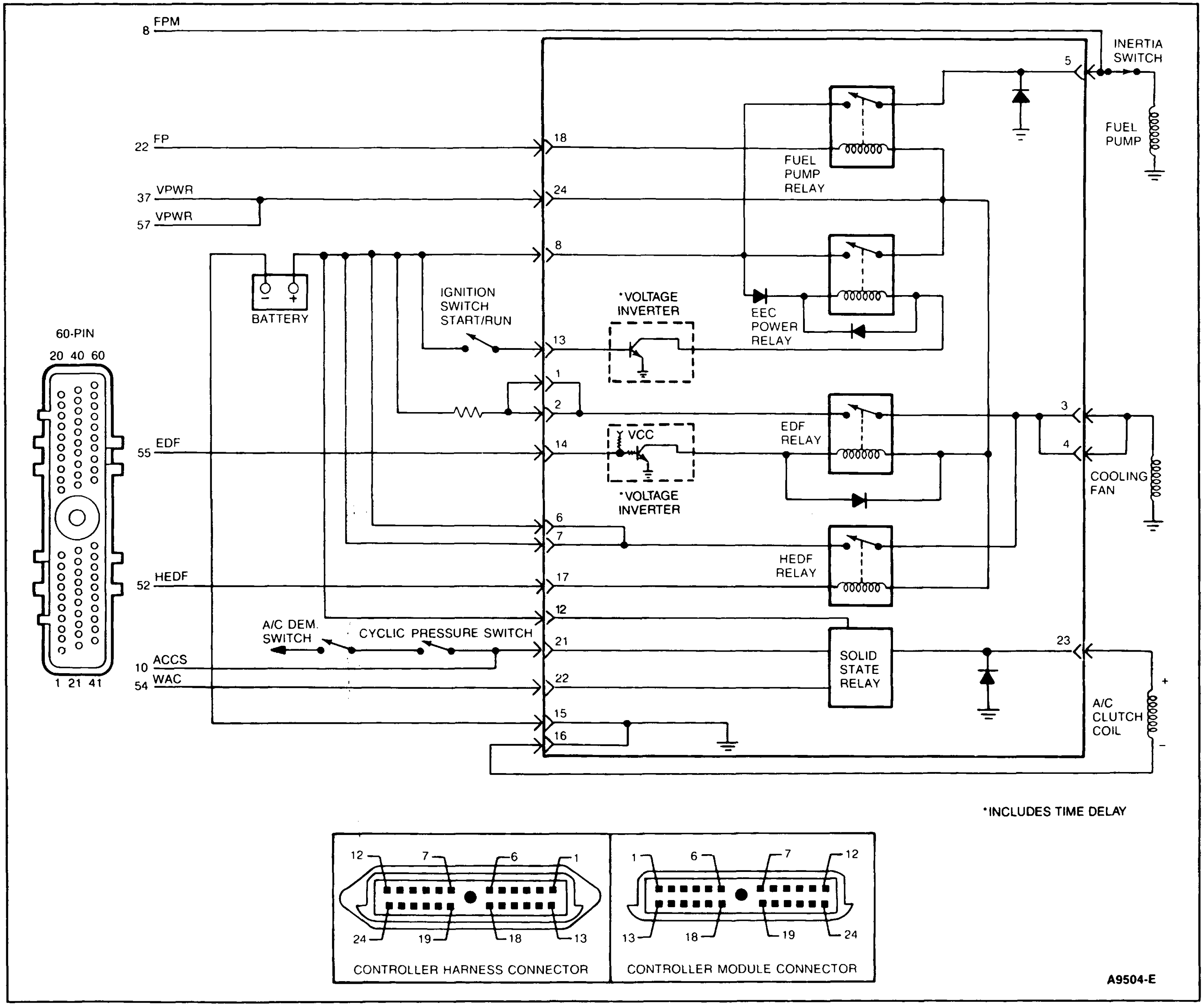
Integrated Controller Schematic

2.5L CLC CFI



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Integrated Controller Pin Usage

2.5L CLC CFI

Pin	Circuit	Color	Application	Abbreviations
1	181	BR/O	EDF Power Into Controller	Batt +
2	181	BR/O	EDF Power Into Controller	Batt +
3	228	BR/Y	H/EDF Power to Fan	PTF
4	228	BR/Y	H/EDF Power to Fan	PTF
5	787	PK/BK	Power to the Pump	PTP
6	38	BK/O	HEDF Power Into Controller	Batt +
7	38	BK/O	HEDF Power Into Controller	Batt +
8	37	Y	Battery Voltage (Power Relay)	Batt +
12	38	BK/O	Power to WOT A/C Cutoff	PT/WAC
13	16	R/LG	Keypower	KPWR
14	197	T/O	EDF Circuit	EDF
15	60	BK/LG	Vehicle Ground	PWR GND
16	57	BK	A/C Ground	A/C GND
17	639	PK	HEDF Circuit	HEDF
18	97	T/LG	Fuel Pump Circuit	FP
21	883	PK/LB	A/C Power	ACCS
22	331	R	WOT A/C Cut Off	WAC
23	347	BK/Y	A/C Power to Clutch Coil	PTAC
24	361	R	Vehicle Power	VPWR

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Quick Test Codes and Code Definitions

2.5L CLC CFI

SERVICE CODE		SERVICE CODE DEFINITION
11	orc ▶	System PASS
12	r ▶	Rpm below Self-Test limit
13	o ▶	D.C. motor did not move
13	r ▶	Rpm above Self-Test limit
13	c ▶	D.C. motor did not follow dashpot
14	c ▶	PIP circuit failure
15	o ▶	ROM test failure
15	c ▶	Power interruption to Keep Alive Memory (KAM)
16	r ▶	Idle hard set high
17	r ▶	Idle hard set low
18	r ▶	SPOUT circuit open
18	c ▶	Loss of tach input to Processor/SPOUT circuit grounded
21	or ▶	ECT sensor input is out of Self-Test range
22	orc ▶	MAP sensor input is out of Self-Test range
23	orc ▶	TP sensor input is out of Self-Test range
24	or ▶	ACT sensor input is out of Self-Test range
29	c ▶	Insufficient input from the Vehicle Speed Sensor (VSS)
31	orc ▶	EVP circuit is below minimum voltage
32	orc ▶	EVP voltage is below closed limit (SONIC)
33	rc ▶	EGR valve is not opening (SONIC)
34	orc ▶	EVP voltage is above closed limit (SONIC)
35	orc ▶	EVP circuit is above maximum voltage
38	c ▶	Idle Tracking Switch (ITS) circuit open
41	r ▶	HEGO sensor circuit indicates system lean
41	c ▶	No HEGO switching detected
42	r ▶	HEGO sensor circuit indicates system rich
51	oc ▶	ECT sensor input is greater than Self-Test maximum
52	o ▶	PSPS circuit is open
52	r ▶	PSPS always staying open or closed
53	oc ▶	TP sensor input is greater than Self-Test maximum
54	oc ▶	ACT sensor input is greater than Self-Test maximum
55	r ▶	Keypower input to processor is open
58	o ▶	Idle Tracking Switch circuit open
58	r ▶	Idle Tracking Switch closed
61	oc ▶	ECT sensor input is less than Self-Test minimum
63	oc ▶	TP sensor input is less than Self-Test minimum
64	oc ▶	ACT sensor input is less than Self-Test minimum
67	o ▶	Neutral Drive Switch (NDS) circuit open; A/C input high
67	c ▶	Clutch switch circuit failure
68	o ▶	Idle Tracking Switch (ITS) closed
68	r ▶	Idle Tracking Switch (ITS) circuit open

(Continued)

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Quick Test Codes and Code Definitions

2.5L CLC CFI

SERVICE CODE		SERVICE CODE DEFINITION
71 c	▶	Idle Tracking Switch (ITS) closed on pre-position
72 c	▶	Power interrupt detected
73 o	▶	Insufficient throttle position change
74 r	▶	Brake On/Off (BOO) circuit failure — not actuated during test
83 o	▶	High speed electro drive fan (HEDF) circuit failure
84 o	▶	EGR Vacuum Regulator (EVR) circuit failure
85 o	▶	Canister Purge (CANP) circuit failure
87 oc	▶	Fuel pump primary circuit failure
88 o	▶	Electro-drive fan (EDF) circuit failure
93 o	▶	TP sensor input low at maximum D.C. motor extension
95 oc	▶	Fuel pump secondary circuit failure
96 oc	▶	Fuel pump secondary circuit failure
99 r	▶	EEC system has not learned to control idle
NO CODES	▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED	▶	*Service codes displayed are not applicable to the vehicle being tested*

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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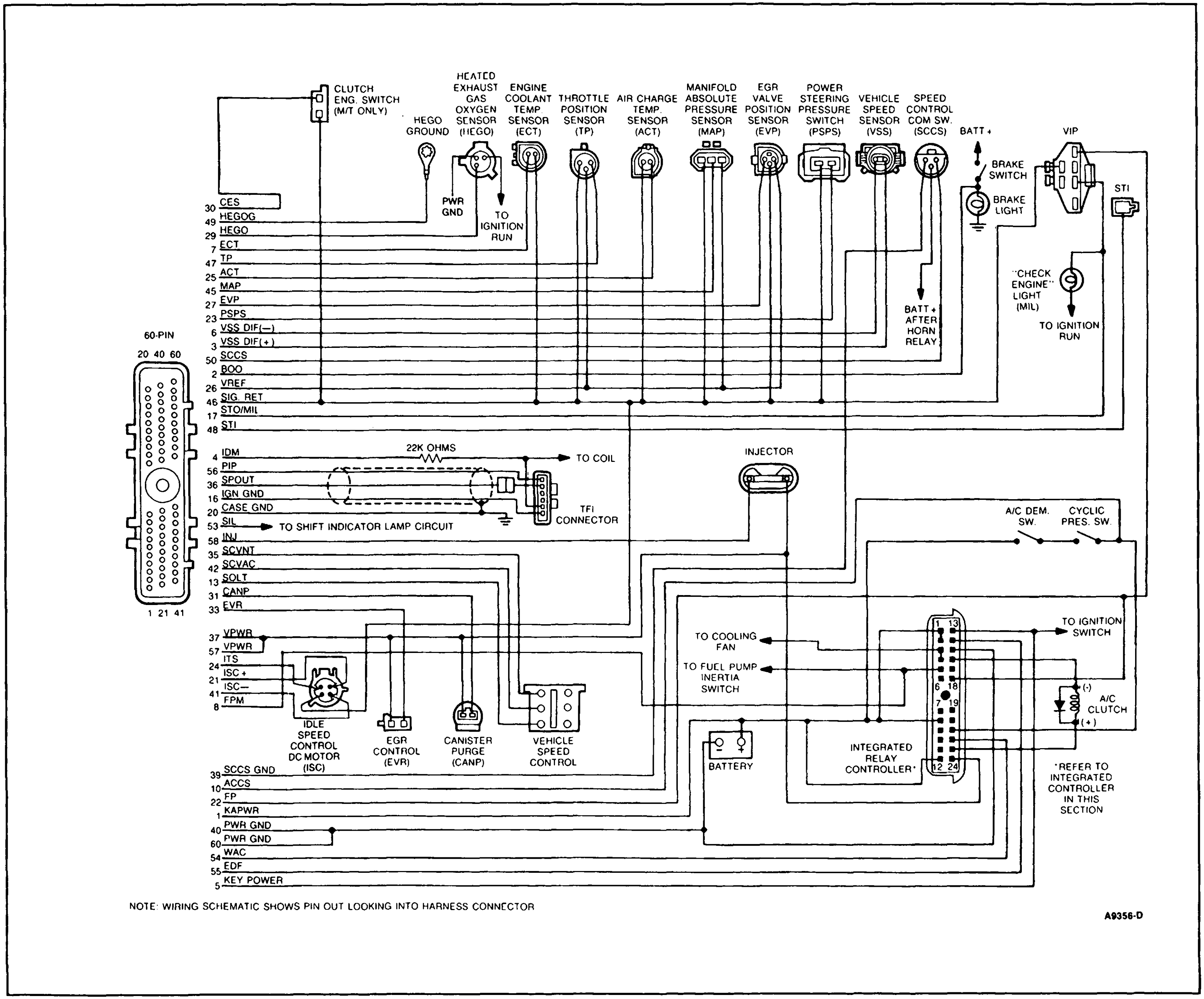
Electrical Schematic



2.5L MTX CFI

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EEC-IV Module Connector Pin Usage

2.5L MTX CFI

Pin	Circuit	Wire Color	Applications	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
2	810	R/LG	Brake On/Off	BOO
3	150	DG/W	Vehicle Speed Sensor +	VSS DIF +
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
5	16	R/LG	Key Power	KPWR
6	563	O/Y	Vehicle Speed Sensor –	VSS DIF –
7	354	LG/Y	Engine Coolant Temperature	ECT
8	787	PK/BK	Fuel Pump Monitor	FPM
10	883	PK/LB	A/C Cycling Switch	ACCS
13	144	O/Y	Vehicle Speed Control Solenoid	SOL +
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Out/"Check Engine" Light	STO/MIL
20	57	BK	Case Ground	CSE GND
21	382	Y/BK	Idle Speed Control (DC Motor)	ISC +
22	97	T/LG	Fuel Pump	FP
23	330	Y/LG	Power Steering Pressure Switch	PSPS
24	209	W/R	Idle Tracking Switch	ITS
25	357	LG/P	Air Charge Temperature	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position	EVP
29	94	DG/P	Heated Exhaust Gas Oxygen (Sensor)	HEGO
30	480	P/Y	Clutch Engage Switch	CES
31	101	GY/Y	Canister Purge Solenoid	CANP
33	360	DG	EGR Vacuum Regulator (Solenoid)	EVR
35	146	W/PK	Speed Control Vent (Solenoid)	SCVNT
36	324	Y/LG	Spark Out	SPOUT
37	361	R	Vehicle Power	VPWR
39	461	O	Speed Control Command Switch Ground	SCCS GND
40	60	BK/LG	Power Ground	PWR GND

(Continued)

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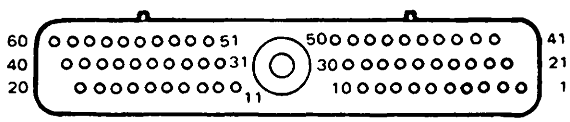
EEC-IV Module Connector Pin Usage

2.5L MTX CFI

Pin	Circuit	Wire Color	Applications	Abbreviations
41	377	W	Idle Speed Control — (DC Motor)	ISC –
42	145	GY/BK	Speed Control Vacuum (Solenoid)	SCVAC
45	358	LG/BK	Manifold Absolute Pressure (Sensor)	MAP
46	359	BK/W	Signal Return (Ground)	SIG RTN
47	355	DG/LG	Throttle Position (Sensor)	TP
48	200	W/BK	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen (Sensor) Ground	HEGO GND
50	151	LB/BK	Speed Control Command Switch	SCCS
53	462	P	Shift Indicator Light	SIL
54	331	R	Wide Open Throttle (WOT) A/C Cut Off	WAC
55	197	T/O	Electro Drive Fan	EDF
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	95	T/R	Injector	INJ
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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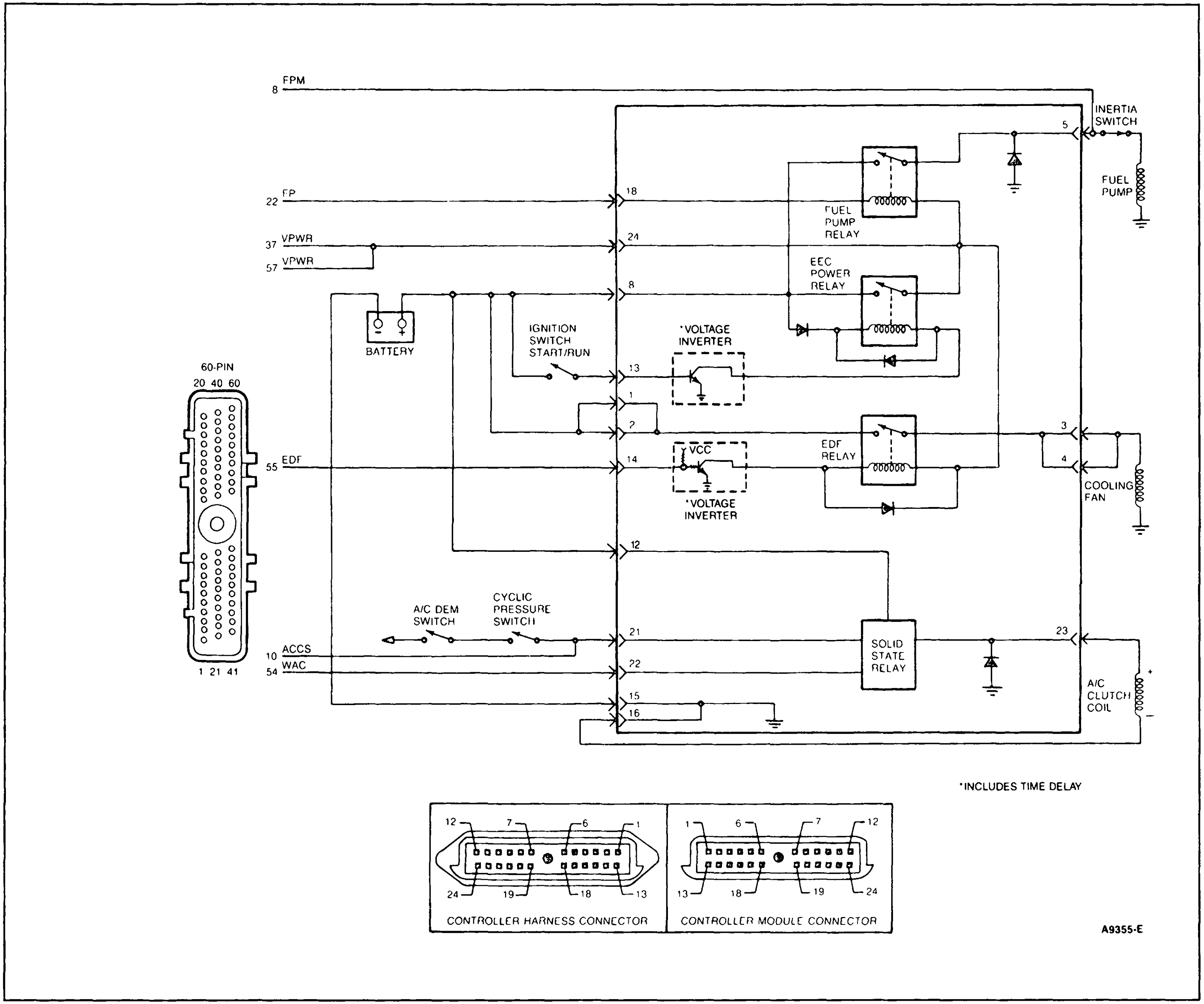
Integrated Controller Schematic

2.5L MTX CFI



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Integrated Controller Pin Usage

2.5L MTX CFI

Pin	Circuit	Color	Application	Abbreviations
1	181	BR/O	EDF Power Into Controller	Batt +
2	181	BR/O	EDF Power Into Controller	Batt +
3	228	BR/Y	H/EDF Power to Fan	PTF
4	228	BR/Y	H/EDF Power to Fan	PTF
5	787	PK/BK	Power to the Pump	PTP
8	37	Y	Battery Voltage (Power Relay)	Batt +
12	38	BK/O	Power to WOT A/C Cut Off	PT/WAC
13	16	R/LG	Keypower	KPWR
14	197	T/O	EDF Circuit	EDF
15	60	BK/LG	Vehicle Ground	PWR GND
16	57	BK	A/C Ground	A/C GND
18	97	T/LG	Fuel Pump Circuit	FP
21	883	PK/LB	A/C Power	ACCS
22	331	R	WOT A/C Cut Off	WAC
23	347	BK/Y	A/C Power to Clutch Coil	PTAC
24	361	R	Vehicle Power	VPWR

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Quick Test Codes and Code Definitions

2.5L MTX CFI

SERVICE CODE		SERVICE CODE DEFINITION
11	orc	System PASS
12	r	Rpm below Self-Test limit
13	o	D.C. motor did not move
13	r	Rpm above Self-Test limit
13	c	D.C. motor did not follow dashpot
14	c	PIP circuit failure
15	o	ROM test failure
15	c	Power interruption to Keep Alive Memory (KAM)
16	r	Idle hard set high
17	r	Idle hard set low
18	r	SPOUT circuit open
18	c	Loss of tach input to Processor/SPOUT circuit grounded
21	or	ECT sensor input is out of Self-Test range
22	orc	MAP sensor input is out of Self-Test range
23	orc	TP sensor input is out of Self-Test range
24	or	ACT sensor input is out of Self-Test range
29	c	Insufficient input from the Vehicle Speed Sensor (VSS)
31	orc	EVP circuit is below minimum voltage
32	orc	EVP voltage is below closed limit (SONIC)
33	rc	EGR valve is not opening (SONIC)
34	orc	EVP voltage is above closed limit (SONIC)
35	orc	EVP circuit is above maximum voltage
38	c	Idle Tracking Switch (ITS) circuit open
41	r	HEGO sensor circuit indicates system lean
41	c	No HEGO switching detected
42	r	HEGO sensor circuit indicates system rich
51	oc	ECT sensor input is greater than Self-Test maximum
52	o	PSPS circuit is open
52	r	PSPS always staying open or closed
53	oc	TP sensor input is greater than Self-Test maximum
54	oc	ACT sensor input is greater than Self-Test maximum
55	r	Keypower input to processor is open
58	o	Idle Tracking Switch circuit open
58	r	Idle Tracking Switch closed
61	oc	ECT sensor input is less than Self-Test minimum
63	oc	TP sensor input is less than Self-Test minimum
64	oc	ACT sensor input is less than Self-Test minimum
67	o	A/C input high
67	c	Clutch switch circuit failure
68	o	Idle Tracking Switch (ITS) closed
68	r	Idle Tracking Switch (ITS) circuit open

(Continued)

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Quick Test Codes and Code Definitions

2.5L MTX CFI

SERVICE CODE	SERVICE CODE DEFINITION
71 c ▶	Idle Tracking Switch (ITS) closed on pre-position
72 c ▶	Power interrupt detected
73 o ▶	Insufficient throttle position change
74 r ▶	Brake On/Off (BOO) circuit failure — not actuated during test
83 o ▶	High speed electro drive fan (HEDF) circuit failure
84 o ▶	EGR Vacuum Regulator (EVR) circuit failure
85 o ▶	Canister Purge (CANP) circuit failure
87 oc ▶	Fuel pump primary circuit failure
88 o ▶	Electro-drive fan (EDF) circuit failure
93 o ▶	TP sensor input low at maximum D.C. motor extension
95 oc ▶	Fuel pump secondary circuit failure
96 oc ▶	Fuel pump secondary circuit failure
99 r ▶	EEC system has not learned to control idle
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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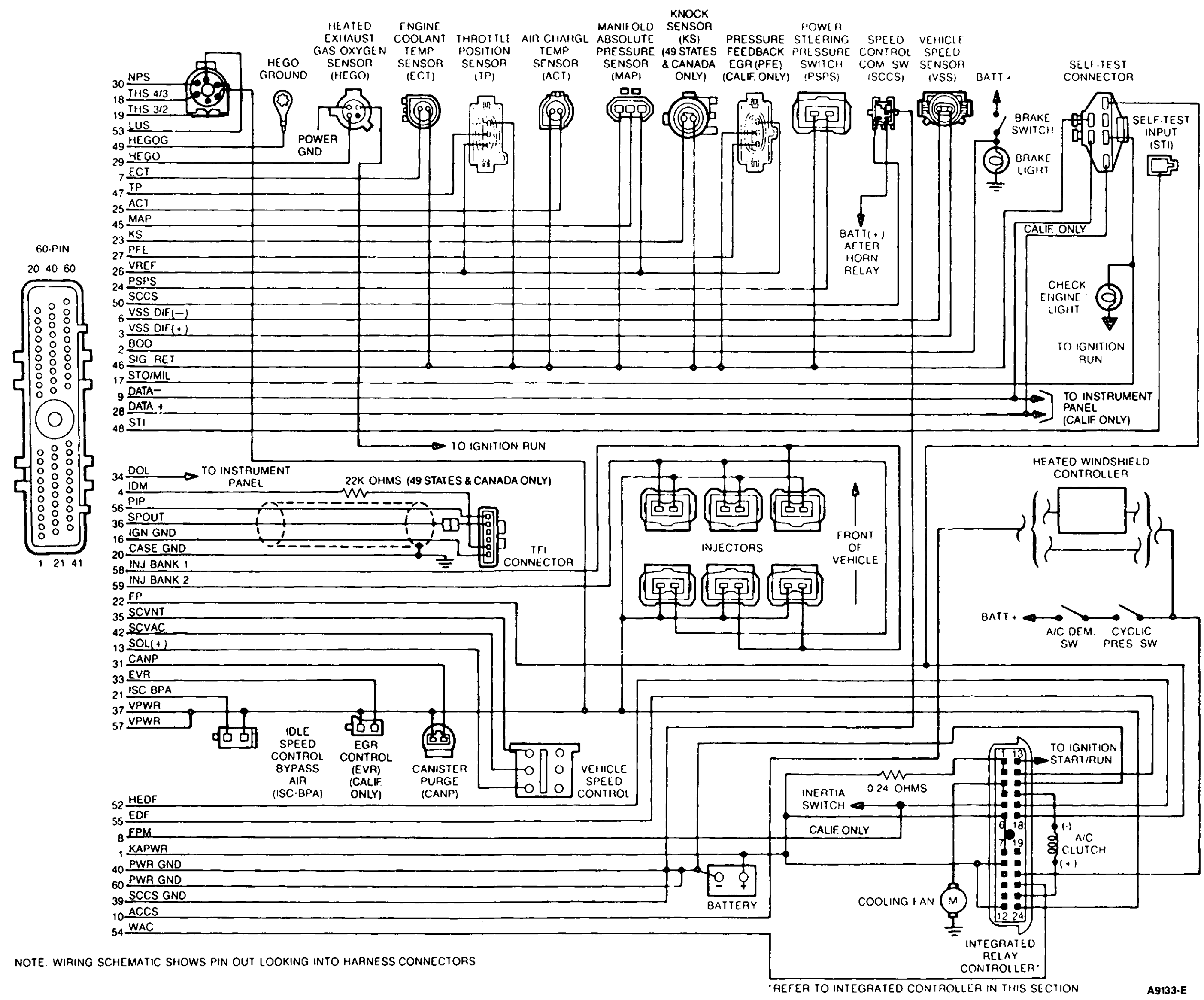

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EEC-IV Module Connector Pin Usage

3.0L EFI

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
2	810	R/LG	Brake On/Off	BOO
3	150	DG/W	Vehicle Speed Sensor +	VSS DIF +
4	648	R/LB	Ignition Diagnostic Monitor (California only)	IDM
4	11	DG/Y	Ignition Diagnostic Monitor (49 States & Canada)	IDM
6	563	O/Y	Vehicle Speed Sensor —	VSS DIF —
7	354	LG/Y	Engine Coolant Temperature Sensor	ECT
8	787	PK/BK	Fuel Pump Monitor (California only)	FPM
9	915	PK/LB	Data Communications Link — (California only)	DATA —
10	585	P	A/C Cycling Switch (with heated Windshield)	ACCS
10	883	PK/LB	A/C Cycling Switch (w/o heated Windshield)	ACCS
13	144	O/Y	Vehicle Speed Control Solenoid	SOL +
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output/"Check Engine" Light	STO/MIL
18	315	DG/P	Transmission 4/3 Switch	THS 4/3
19	237	O/Y	Transmission 3/2 Switch	THS 3/2
20	57	BK	Case Ground	CSE GND
21	68	O/BK	Idle Speed Control — Bypass Air	ISC-BPA
22	97	T/LG	Fuel Pump	FP
23	310	Y/R	Knock Sensor (49 States & Canada)	KS
24	330	Y/LG	Power Steering Pressure Switch	PSPS
25	357	LG/P	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	Pressure Feedback EGR (California only)	PFE
28	914	T/O	Data Communications Link + (California only)	DATA +
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	480	P/Y	Neutral Pressure Switch	NPS
31	101	GY/Y	Canister Purge Solenoid	CANP
33	360	DG	EGR Vacuum Regulator Solenoid (California only)	EVR
34	305	LB/PK	Data Output Link	DOL
35	146	W/PK	Speed Control Vent Solenoid	SCVNT

(Continued)

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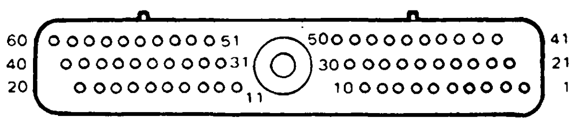
EEC-IV Module Connector Pin Usage

3.0L EFI

Pin	Circuit	Wire Color	Application	Abbreviations
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
39	461	O	Speed Control Command Switch Ground	SCCS GND
40	60	BK/LG	Power Ground	PWR GND
42	145	GY/BK	Speed Control Vacuum Solenoid	SCVAC
45	358	LG/BK	Manifold Absolute Pressure Sensor	MAP
46	359	BK/W	Signal Return Ground	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	200	W/BK	Self Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Sensor Ground	HEGO GND
50	151	LB/BK	Speed Control Command Switch	SCCS
52	639	PK	High Electro Drive Fan	HEDF
53	224	T/LB	Lock-Up Solenoid (Transmission)	LUS
54	331	R	Wide Open Throttle (WOT) A/C Cut Off	WAC
55	197	T/O	Electro Drive Fan (Low)	EDF
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	95	T/R	Injector Bank 1	INJ Bank 1
59	96	T/O	Injector Bank 2	INJ Bank 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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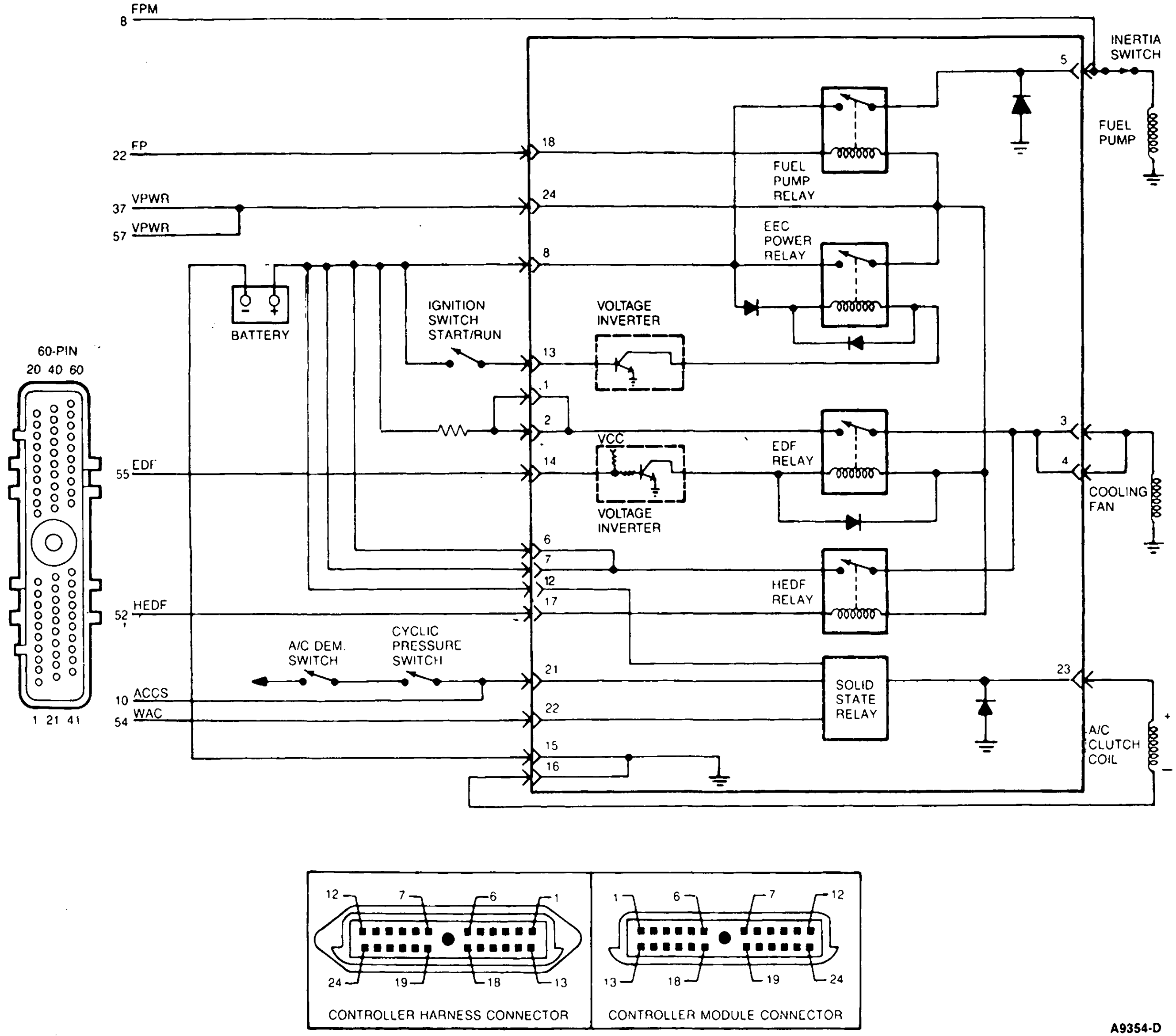
Integrated Controller Schematic

3.0L EFI



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Integrated Controller Pin Usage

3.0L EFI

Pin	Circuit	Color	Applications	Abbreviations
1	181	BR/O	Power to EDF Relay	PT/EDF
2	181	BR/O	Power to EDF Relay	PT/EDF
3	228	BR/Y	Power to Cooling Fan	PTF
4	228	BR/Y	Power to Cooling Fan	PTF
5	787	PK/BK	Power to Fuel Pump	PTP
6	38	BK/O	Power to HEDF Relay	PT/HEDF
7	38	BK/O	Power to HEDF Relay	PT/HEDF
8	37	Y	Battery to EEC Relay	BATT +
12	38	BK/O	Power to WOT A/C Cut Off	PT/WAC
13	16	R/LG	Key Power	KEY PWR
14	197	T/O	EDF Circuit	EDF
15	60	BK/LG	Power Ground	PWR GRD
16	57	BK	A/C Clutch Ground	PWR GRD
17	639	PK	HEDF Circuit	HEDF
18	97	T/LG	Fuel Pump	FP
21	883	PK/LB	A/C Cyclic Switch	ACCS
22	331	R	WOT A/C Cut Off	WAC
23	347	BK/Y	Power to A/C	PTAC
24	361	R	Vehicle Power	VPWR

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Quick Test Codes and Code Definitions

3.0L EFI

SERVICE CODE			SERVICE CODE DEFINITION
11	orc	▶	System PASS
12	r	▶	Unable to control rpm to Self-Test upper limit band
13	r	▶	Unable to control rpm to Self-Test lower limit band
14	c	▶	PIP circuit failure
15	o	▶	ROM test failure
15	c	▶	Power interruption to Keep Alive Memory (KAM)
18	r	▶	SPOUT circuit open
18	c	▶	Loss of tach input to Processor/SPOUT circuit grounded
19	o	▶	Failure of EEC power supply
21	or	▶	ECT sensor input is out of Self-Test range
22	orc	▶	MAP sensor input is out of Self-Test range
23	or	▶	TP sensor input is out of Self-Test range
24	or	▶	ACT sensor input is out of Self-Test range
25	r	▶	KS sensor signal is not sensed in Dynamic Response Test
29	c	▶	Insufficient input from the Vehicle Speed Sensor (VSS)
31	orc	▶	PFE circuit is below minimum voltage
32	rc	▶	EGR valve not seated
33	rc	▶	EGR valve is not opening (PFE)
34	o	▶	Defective PFE sensor
34	rc	▶	Excessive exhaust back pressure
35	orc	▶	PFE circuit is above maximum voltage
39	c	▶	AXOD converter bypass clutch not applying properly
41	r	▶	HEGO sensor circuit indicates system lean
41	c	▶	No HEGO switching detected
42	r	▶	HEGO sensor circuit indicates system rich
51	oc	▶	ECT sensor input is greater than Self-Test maximum
52	o	▶	PSPS circuit is open
52	r	▶	PSPS always staying open or closed
53	oc	▶	TP sensor input is greater than Self-Test maximum
54	oc	▶	ACT sensor input is greater than Self-Test maximum
57	c	▶	AXOD Neutral Pressure Switch (NPS) circuit failed open
59	c	▶	AXOD 4/3 pressure switch circuit failed open
61	oc	▶	ECT sensor input is less than Self-Test minimum
62	o	▶	AXOD 4/3 or 3/2 pressure switch circuit failed closed
63	oc	▶	TP sensor input is less than Self-Test minimum
64	oc	▶	ACT sensor input is less than Self-Test minimum
67	o	▶	Neutral Pressure Switch (NPS) circuit open; A/C input high
69	c	▶	AXOD 3/4 pressure switch circuit failed open
72	r	▶	Insufficient MAP output change during Dynamic Response Test

(Continued)

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Quick Test Codes and Code Definitions

3.0L EFI

SERVICE CODE	SERVICE CODE DEFINITION
73 r ▶	Insufficient TP output change during Dynamic Response Test
74 r ▶	Brake On/Off (BOO) circuit failure — not actuated during test
77 r ▶	Brief WOT not sensed during Self-Test/Operator error
83 o ▶	High speed electro drive fan (HEDF) circuit failure
84 o ▶	EGR Vacuum Regulator (EVR) circuit failure
85 o ▶	Canister Purge (CANP) circuit failure
87 oc ▶	Fuel pump primary circuit failure
88 o ▶	Electro-drive fan (EDF) circuit failure
89 o ▶	AXOD Lock-Up Solenoid (LUS) circuit failed
95 oc ▶	Fuel pump secondary circuit failure
96 oc ▶	Fuel pump secondary circuit failure
98 r ▶	Hard fault is present
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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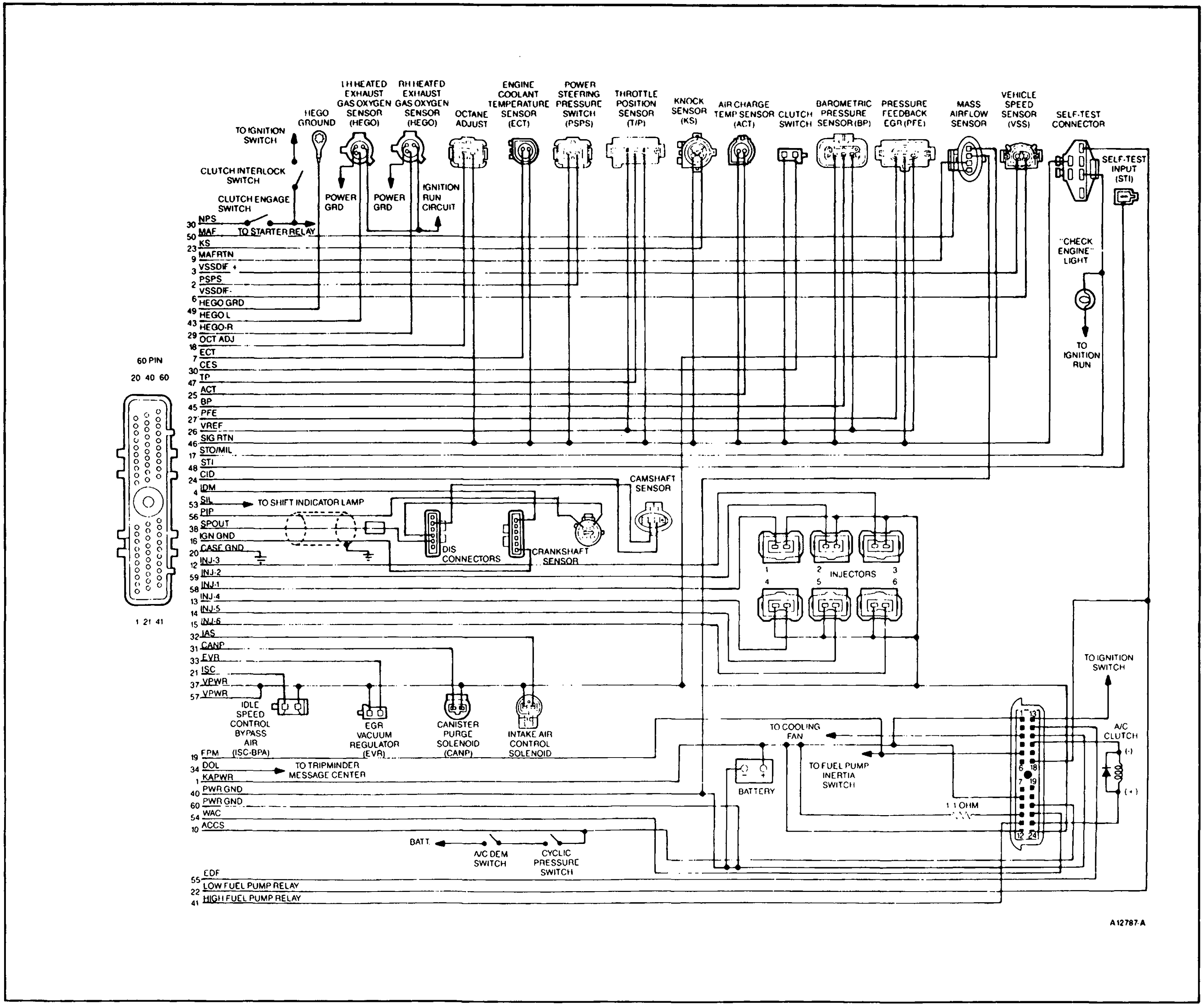
Electrical Schematic

3.0L SHO SEFI



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EEC-IV Module Connector Pin Usage

3.0L SHO SEFI

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
2	330	Y/LG	Power Steering Pressure Switch	PSPS
3	150	DG/W	Vehicle Speed Sensor +	VSS DIF +
4	395	GY/O	Ignition Diagnostic Monitor	IDM
5	810	R/LG	Brake On/Off	BOO
6	563	O/Y	Vehicle Speed Sensor –	VSS DIF —
7	354	LG/Y	Engine Coolant Temperature	ECT
9	968	T/LB	Mass Air Signal Return	MAF RTN
10	883	PK/LB	A/C Clutch Signal	ACCS
11	144	O/Y	Vehicle Speed Control Solenoid	SOL +
12	557	BR/Y	Injector #3	INJ 3
13	558	BR/LB	Injector #4	INJ 4
14	559	T/LB	Injector #5	INJ 5
15	560	LG	Injector #6	INJ 6
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output/"Check Engine Light"	STO/MIL
18	929	PK	Octane Adjust	OCT ADJ
19	787	PK/BK	Fuel Pump Monitor	FPM
20	57	BK	Case Ground	CASE GND
21	68	O/BK	Idle Speed Control Bypass Air	ISC
22	97	T/LG	Low Fuel Pump Relay	LFP
23	310	Y/R	Knock Sensor	KS
24	795	DG	Cylinder Identification Sensor	CID
25	357	LG/P	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	Pressure Feedback EGR	PFE
28	151	LB/BK	Speed Control Command Switch	SCCS
29	94	DG/P	Heated Exhaust Gas Oxygen	#1 HEGO

(Continued)

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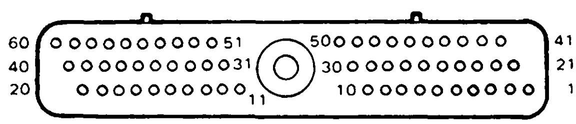
EEC-IV Module Connector Pin Usage

3.0L SHO SEFI

Pin	Circuit	Wire Color	Application	Abbreviations
30	480	P/Y	Clutch Switch	CES
31	101	GY/Y	Canister Purge	CANP
32	965	LG/P	Intake Air Control Solenoid	IAC
33	360	DG	EGR Valve Regulator	EVR
35	146	W/PK	Speed Control Vent (Solenoid)	SCVNT
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
39	461	O	Speed Control Command Switch Ground	SCCS GND
40	60	BK/LG	Power Ground	PWR GND
41	926	LB/O	High Fuel Pump Relay	HFP
43	90	DB/LG	Heated Exhaust Gas Oxygen	#2 HEGO
45	358	LG/BK	Barometric Absolute Pressure	BAP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	200	W/BK	Self-Test Input	STI
49	89	O	Heated EGO Sensor Ground	HEGO GND
50	967	DB/O	Mass Air Flow Sensor	MAF
51	145	GY/BK	Speed Control Vacuum (Solenoid)	SCVAC
54	331	R	Wide Open Throttle A/C Cutoff	WAC
55	197	T/O	Electro-Drive Fan	EDF
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	555	T	Injector #1	INJ 1
59	556	W	Injector #2	INJ 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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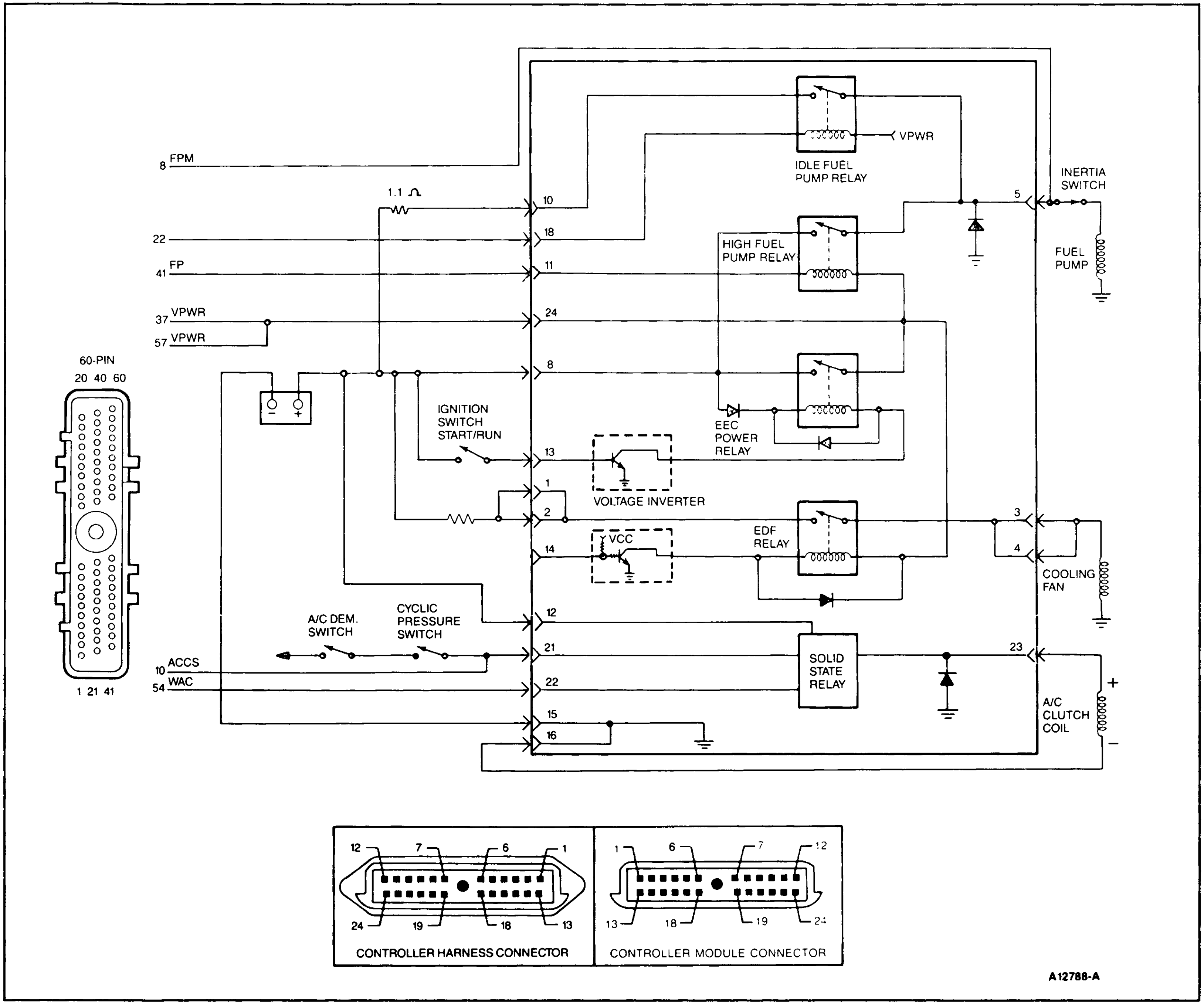
Integrated Controller Schematic



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Integrated Controller Pin Usage

3.0L SHO SEFI

Pin	Circuit	Color	Applications	Abbreviations
1	38	BR/O	Power to EDF Relay	PT/EDF
2	38	BR/O	Power to EDF Relay	PT/EDF
3	181	BR/Y	Power to Cooling Fan	PTF
4	181	BR/Y	Power to Cooling Fan	PTF
5	787	PK/BK	Power to Fuel Pump	PTP
8	37	Y	Battery to EEC Relay	BATT +
10	922	W/R	Power to Low Fuel Pump Relay	PT/LFP
11	926	LB/O	High Fuel Pump	H/FP
12	38	BK/Y	Power to WOT A/C Cut Off	PT/WAC
13	16	R/LG	Key Power	KEY PWR
14	197	T/O	EDF Circuit	EDF
15	57	BK	Power Ground	PWR GRD
16	57	BK	A/C Clutch Ground	PWR GRD
18	97	T/LG	Low Fuel Pump	L/FP
21	883	PK/LB	A/C Cyclic Switch	ACCS
22	331	R	WOT A/C Cut Off	WAC
23	347	BK/Y	Power to A/C	PTAC
24	361	R	Vehicle Power	VPWR

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Quick Test Codes and Code Definitions

3.0L SHO SEFI

SERVICE CODE		SERVICE CODE DEFINITION
11	orc ▶	System PASS
12	r ▶	Unable to control rpm to Self-Test upper limit band
13	r ▶	Unable to control rpm to Self-Test lower limit band
14	c ▶	PIP circuit failure
15	o ▶	ROM test failure
15	c ▶	Power interruption to Keep Alive Memory (KAM)
18	r ▶	SPOUT circuit open
18	c ▶	Loss of tach input to Processor, SPOUT circuit grounded
19	c ▶	CID sensor input failed
21	or ▶	ECT sensor input is out of Self-Test range
22	oc ▶	BP sensor input is out of Self-Test range
23	or ▶	TP sensor input is out of Self-Test range
24	or ▶	ACT sensor input is out of Self-Test range
25	r ▶	KS sensor signal is not sensed in Dynamic Response Test
26	or ▶	MAF sensor input is out of Self-Test range
29	c ▶	Insufficient input from the Vehicle Speed Sensor (VSS)
31	orc ▶	PFE circuit is below minimum voltage
32	rc ▶	EGR valve not seated
33	rc ▶	EGR valve is not opening (PFE)
34	o ▶	Defective PFE sensor
34	rc ▶	Excessive exhaust back pressure
35	orc ▶	PFE circuit is above maximum voltage
41	r ▶	HEGO sensor circuit indicates system lean (right HEGO)
41	c ▶	No HEGO switching detected (right HEGO)
42	r ▶	HEGO sensor circuit indicates system rich (right HEGO)
45	c ▶	DIS Coil pack 3 circuit failure
46	c ▶	DIS Coil pack 1 circuit failure
48	c ▶	DIS Coil pack 2 circuit failure
49	c ▶	SPOUT signal defaulted to 10 degrees BTDC
51	oc ▶	ECT sensor input is greater than Self-Test maximum
52	o ▶	PSPS circuit is open
52	r ▶	PSPS always staying open or closed
53	oc ▶	TP sensor input is greater than Self-Test maximum
54	oc ▶	ACT sensor input is greater than Self-Test maximum
56	oc ▶	MAF sensor input is greater than Self-Test maximum
59	oc ▶	Low speed fuel pump circuit failure
61	oc ▶	ECT sensor input is less than Self-Test minimum
63	oc ▶	TP sensor input is less than Self-Test minimum
64	oc ▶	ACT sensor input is less than Self-Test minimum
66	c ▶	MAF sensor input is less than Self-Test minimum
67	o ▶	Neutral Pressure Switch (NPS) circuit open; A/C input high

(Continued)

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Quick Test Codes and Code Definitions

3.0L SHO SEFI

SERVICE CODE		SERVICE CODE DEFINITION
72 r	▶	Insufficient BP output change during Dynamic Response Test
73 r	▶	Insufficient TP output change during Dynamic Response Test
74 r	▶	Brake On/Off (BOO) circuit failure — not actuated during test
77 r	▶	Brief WOT not sensed during Self-Test/Operator error
79 o	▶	A/C on during Self-Test
81 o	▶	Insufficient IAS output voltage change when solenoid activate
83 oc	▶	Low speed fuel pump relay circuit open
84 o	▶	EGR Vacuum Regulator (EVR) circuit failure
85 o	▶	Canister Purge (CANP) circuit failure
87 oc	▶	Fuel pump primary circuit failure
88 o	▶	Electro-Drive Fan (EDF) circuit failure
91 r	▶	HEGO sensor circuit indicates system lean (left HEGO)
91 c	▶	No HEGO switching detected (left HEGO)
92 r	▶	HEGO sensor circuit indicates system rich (left HEGO)
95 oc	▶	Fuel pump secondary circuit failure
96 oc	▶	High speed fuel pump relay circuit open
98 r	▶	Hard fault is present
NO CODES	▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED	▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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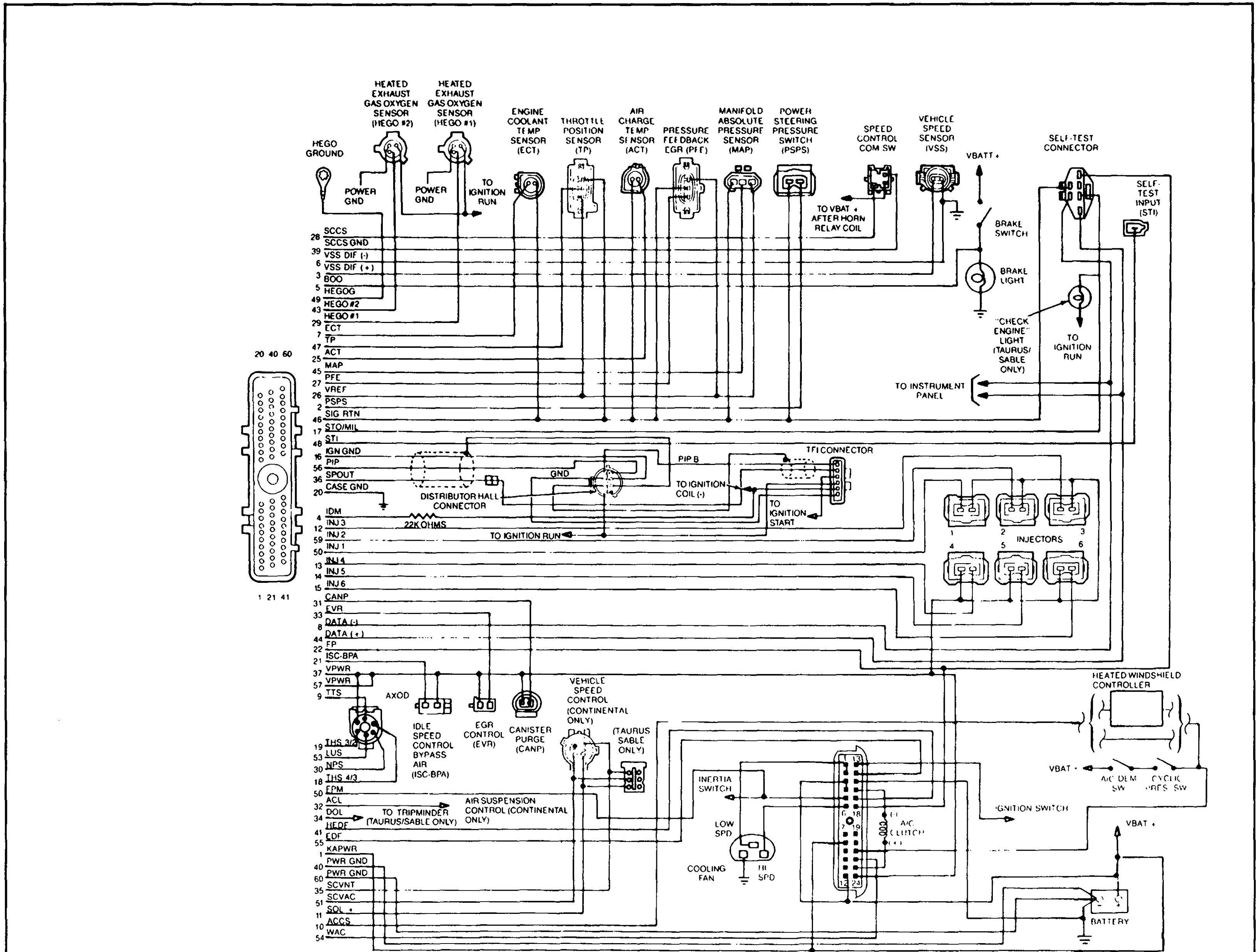
Electrical Schematic

3.8L AXOD SEFI



NOTE: WIRING SCHEMATIC SHOWS PINOUTS LOOKING INTO HARNESS CONNECTORS

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EEC-IV Module Connector Pin Usage

3.8L AXOD SEFI

Pin	Car Lines				Application	Abbreviations
	Taurus/Sable		Continental			
	Crt.#	Wire Color	Crt.#	Wire Color		
1	37	Y	37	Y	Keep Alive Power	KAPWR
2	330	Y/LG	330	Y/LG	Power Steering Pressure Switch	PSPS
3	150	DG/W	150	DG/W	Vehicle Speed Sensor +	VSS DIF +
4	11	DG/Y	11	DG/Y	Ignition Diagnostic Monitor	IDM
5	810	R/LG	810	R/LG	Brake On/Off	BOO
6	563	O/Y	563	O/Y	Vehicle Speed Sensor –	VSS DIF –
7	354	LG/Y	354	LG/Y	Engine Coolant Temperature Sensor	ECT
8	915	BK/LB	695	BK/O	Data Communications Link –	DATA –
9	854	GY/W	854	GY/W	Transmission Temperature Switch	TTS
10	585	P	585	P	A/C Cycling Switch (w/htd. windshield)	ACCS
10	883	PK/LB	348	LG/P	A/C Cycling Switch (w/o htd. windshield)	ACCS
11	144	O/Y	144	O/Y	Vehicle Speed Control Solenoid	SOL +
12	557	BR/Y	557	BR/Y	Injector #3	INJ 3
13	558	BR/LB	558	BR/LB	Injector #4	INJ 4
14	559	T/LB	559	T/LB	Injector #5	INJ 5
15	560	LG	560	LG	Injector #6	INJ 6
16	350	GY	350	GY	Ignition Ground	IGN GND
17	201	T/R	201	T/R	Self-Test Output/"Check Engine" Light	STO/MIL
18	315	DG/P	315	DG/P	Transmission 4/3 Switch	THS 4/3
19	237	O/Y	237	O/Y	Transmission 3/2 Switch	THS 3/2
20	57	BK	57	BK	Case Ground	CASE GND
21	68	O/BK	68	O/BK	Idle Speed Control - Bypass Air	ISC - BPA
22	97	T/LG	97	T/LG	Fuel Pump	FP
25	357	LG/P	357	LG/P	Air Charge Temperature Sensor	ACT
26	351	O/W	351	O/W	Reference Voltage	VREF
27	352	BR/LG	352	BR/LG	Pressure Feedback EGR	PFE
28	151	LB/BK	151	LB/BK	Speed Control Command Switch	SCCS
29	90	DB/LG	90	DB/LG	Heated Exhaust Gas Oxygen Sensor	HEGO #1
30	480	P/Y	480	P/Y	Neutral Pressure Switch	NPS
31	101	GY/Y	101	GY/Y	Canister Purge Solenoid	CANP
32	—	—	637	LG	Air Suspension Control	ACL
33	360	DG	360	DG	EGR Vacuum Regulator Solenoid	EVR
34	305	LB/PK	—	—	Data Output Line	DOL
35	146	W/PK	146	W/PK	Speed Control Vent Solenoid	SCVNT

(Continued)

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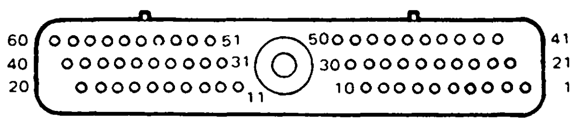
EEC-IV Module Connector Pin Usage

3.8L AXOD SEFI

Pin	Taurus/Sable Crt.#	Taurus/Sable Wire Color	Continental Crt.#	Continental Wire Color	Application	Abbreviations
36	324	Y/LG	324	Y/LG	Spark Output	SPOUT
37	361	R	361	R	Vehicle Power	VPWR
39	461	O	461	O	Speed Control Command Switch Ground	SCCS GND
40	60	BK/LG	60	BK/LG	Power Ground	PWR GND
41	639	PK	639	PK	High Electro Drive Fan	HEDF
43	94	DG/P	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO #2
44	914	T/O	696	O/BK	Data Communications Link +	DATA +
45	358	LG/BK	358	LG/BK	Manifold Absolute Pressure Sensor	MAP
46	359	BK/W	359	BK/W	Signal Return Ground	SIG RTN
47	355	DG/LG	355	DG/LG	Throttle Position Sensor	TP
48	200	W/BK	200	W/BK	Self Test Input	STI
49	89	O	89	O	Heated EGO Ground	HEGO GND
50	787	PK/BK	787	PK/BK	Fuel Pump Monitor	FPM
51	145	GY/BK	145	GY/BK	Speed Control Vacuum Solenoid	SCVAC
53	224	T/LB	224	T/LB	Lock-Up Solenoid (Transmission)	LUS
54	331	R	331	R	Wide Open Throttle (WOT) A/C Cut Off	WAC
55	197	T/O	197	T/O	Electro Drive Fan — Low	EDF
56	349	DB	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	361	R	Vehicle Power	VPWR
58	555	T	555	T	Injector #1	INJ 1
59	556	W	556	W	Injector #2	INJ 2
60	60	BK/LG	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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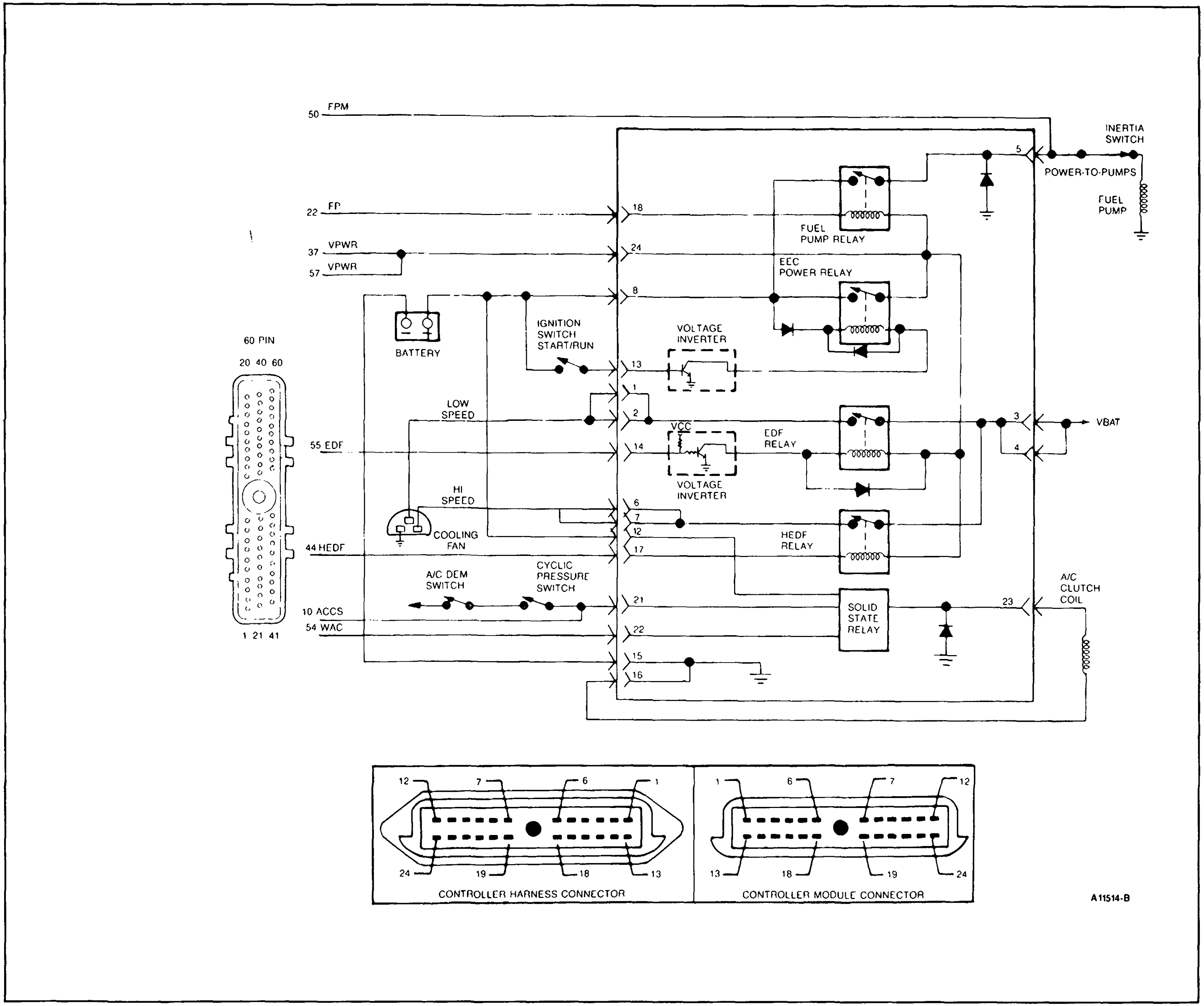
Integrated Controller Schematic

3.8L AXOD SEFI



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Integrated Controller Pin Usage

3.8L AXOD SEFI

Pin	Circuit	Color	Applications	Abbreviations
1	181	BR/O	Power to EDF Cooling Fan	PT/EDF
2	181	BR/O	Power to EDF Cooling Fan	PT/EDF
3	38	BK/O	Power to Cooling Fan Relay	PTF
4	38	BK/O	Power to Cooling Fan Relay	PTF
5	787	PK/BK	Power to Fuel Pump	PTP
6	228	BR/Y	Power to HEDF Cooling Fan	PT/HEDF
7	228	BR/Y	Power to HEDF Cooling Fan	PT/HEDF
8	37	Y	Battery to EEC Cooling Fan	BATT -
12	38	BK/O	Power to WOT A/C Cut Off	PT/WAC
13	16	R/LG	Key Power	KEY PWR
14	197	T/O	EDF Circuit	EDF
15	60	BK/LG	Power Ground	PWR GRD
16	321	GY/W	A/C Clutch Ground	PWR GRD
17	639	PK	HEDF Circuit	HEDF
18	97	T/LG	Fuel Pump	FP
21	348	LG/P	A/C Cyclic Switch	ACCS
22	331	R	WOT A/C Cut Off	WAC
23	347	BK/Y	Power to A/C	PTAC
24	361	R	Vehicle Power	VPWR

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Quick Test Codes and Code Definitions

3.8L AXOD SEFI

SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Unable to control rpm to Self-Test upper limit band
13 r ▶	Unable to control rpm to Self-Test lower limit band
14 c ▶	PIP circuit failure
15 o ▶	ROM test failure
15 c ▶	Power interruption to Keep Alive Memory (KAM)
18 r ▶	SPOUT circuit open
18 c ▶	Loss of tach input to Processor/SPOUT circuit grounded
19 o ▶	Failure of EEC power supply
21 or ▶	ECT sensor input is out of Self-Test range
22 orc ▶	MAP sensor input is out of Self-Test range
23 or ▶	TP sensor input is out of Self-Test range
24 or ▶	ACT sensor input is out of Self-Test range
29 c ▶	Insufficient input from the Vehicle Speed Sensor (VSS)
31 orc ▶	PFE circuit is below minimum voltage
32 rc ▶	EGR valve not seated
33 rc ▶	EGR valve is not opening (PFE)
34 o ▶	Defective PFE sensor
34 rc ▶	Excessive exhaust back pressure
35 orc ▶	PFE circuit is above maximum voltage
39 c ▶	AXOD converter bypass clutch not applying properly
41 r ▶	HEGO sensor circuit indicates system lean (right HEGO)
41 c ▶	No HEGO switching detected (right HEGO)
42 r ▶	HEGO sensor circuit indicates system rich (right HEGO)
51 oc ▶	ECT sensor input is greater than Self-Test maximum
52 o ▶	PSPS circuit is open
52 r ▶	PSPS always staying open or closed
53 oc ▶	TP sensor input is greater than Self-Test maximum
54 oc ▶	ACT sensor input is greater than Self-Test maximum
57 c ▶	AXOD Neutral Pressure Switch (NPS) circuit failed open
59 o ▶	AXOD 4/3 pressure switch circuit failed closed
59 c ▶	AXOD 4/3 pressure switch circuit failed open
61 oc ▶	ECT sensor input is less than Self-Test minimum
63 oc ▶	TP sensor input is less than Self-Test minimum
64 oc ▶	ACT sensor input is less than Self-Test minimum
67 o ▶	AXOD Neutral Pressure Switch (NPS) circuit failed closed
68 orc ▶	AXOD Transmission Temperature Switch (TTS) failed open
69 o ▶	AXOD 3/2 pressure switch circuit failed closed
69 c ▶	AXOD 3/4 pressure switch circuit failed open

(Continued)

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Quick Test Codes and Code Definitions

3.8L AXOD SEFI

SERVICE CODE	SERVICE CODE DEFINITION
70 c ▶	EEC IV data transmission circuit failed (DCL)
71 c ▶	Cluster Control Assembly (CCA) circuit failed (DCL)
72 c ▶	Message Center Control Assembly (MCCA) circuit failed (DCL)
74 r ▶	Brake On/Off (BOO) circuit failure — not actuated during test
79 o ▶	A/C on during Self-Test
83 o ▶	High speed electro drive fan (HEDF) circuit failure
84 o ▶	EGR Vacuum Regulator (EVR) circuit failure
85 o ▶	Canister Purge (CANP) circuit failure
87 oc ▶	Fuel pump primary circuit failure
88 o ▶	Electro-Drive Fan (EDF) circuit failure
89 o ▶	AXOD Lock-Up Solenoid (LUS) circuit failed
91 r ▶	HEGO sensor circuit indicates system lean (left HEGO)
91 c ▶	No HEGO switching detected (left HEGO)
92 r ▶	HEGO sensor circuit indicates system rich (left HEGO)
95 oc ▶	Fuel pump secondary circuit failure
96 oc ▶	Fuel pump secondary circuit failure
98 r ▶	Hard fault present
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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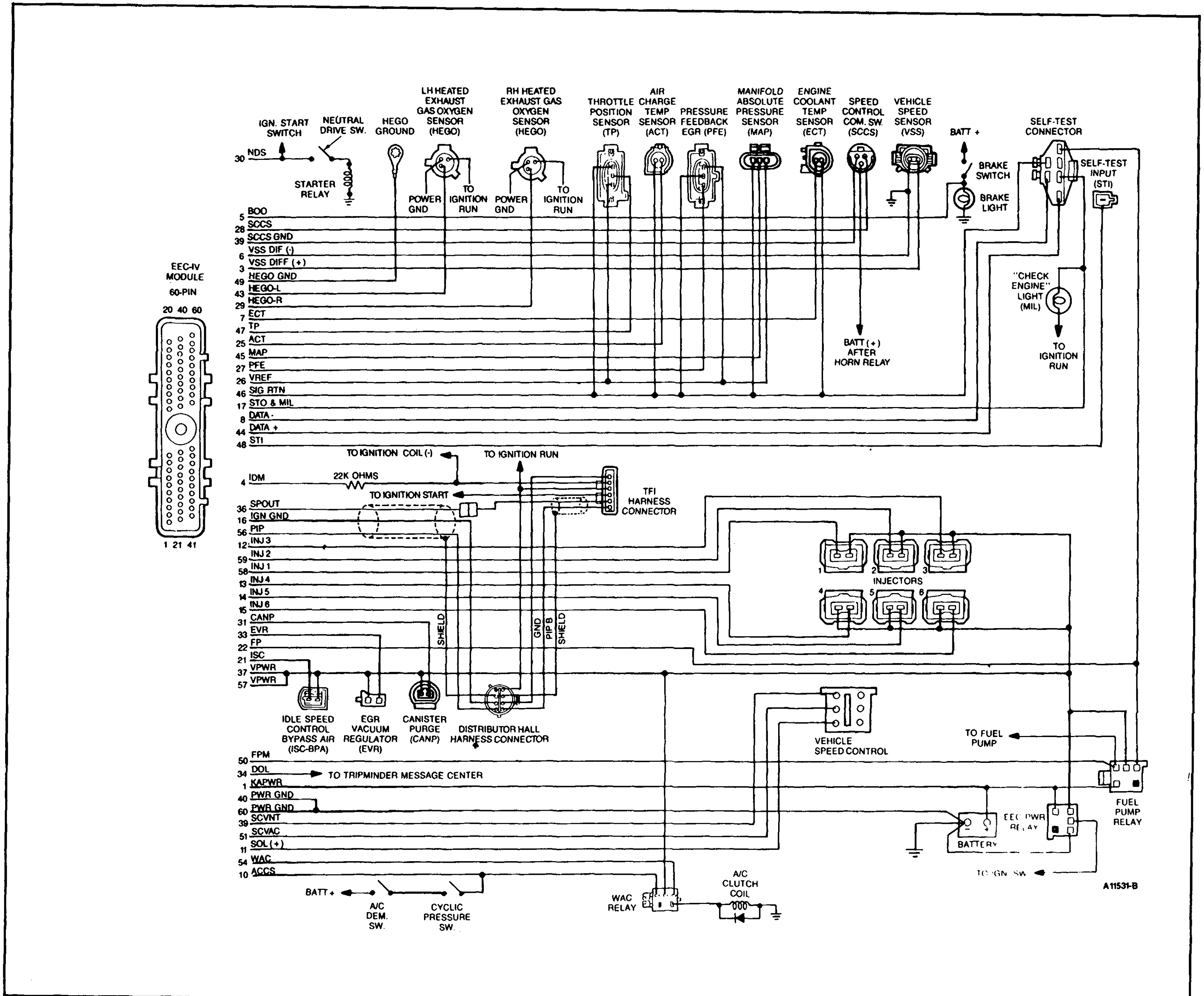
Electrical Schematic

3.8L RWD SEFI



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EEC-IV Module Connector Pin Usage

3.8L RWD SEFI

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
3	150	DG/W	Vehicle Speed Sensor +	VSS DIF +
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
5	511	LG	Brake On/Off	BOO
6	359	BK/W	Vehicle Speed Sensor –	VSS DIF –
7	354	LG/Y	Engine Coolant Temperature	ECT
8	696	O/BK	Data Communications Link –	DATA –
10	883	PK/LB	A/C Cycling Switch	ACCS
11	144	O/Y	Vehicle Speed Control Solenoid	SOL +
12	557	BR/Y	Injector #3	INJ 3
13	558	BR/LB	Injector #4	INJ 4
14	559	T/LB	Injector #5	INJ 5
15	560	LG	Injector #6	INJ 6
16	259	BK/O	Ignition Ground	IGN GND
17	382	Y/BK	Self-Test Output and "Check Engine" Light	STO/MIL
20	57	BK	Case Ground	CSE GND
21	69	R/LG	Idle Speed Control – Bypass Air	ISC – BPA
22	97	T/LG	Fuel Pump	FP
25	357	LG/P	Air Charge Temperature	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	Pressure Feedback EGR	PFE
28	151	LB/BK	Speed Control Command Switch	SCCS
29	96	T/O	Heated Exhaust Gas Oxygen Sensor – R	HEGO – R
30	32	R/LB	Neutral Drive Switch	NDS
31	101	GY/Y	Canister Purge	CANP
33	360	DG	EGR Vacuum Regulator	EVR
34	305	LB/PK	Data Output Link	DOL
35	146	W/PK	Speed Control Vent Solenoid	SCVNT
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
39	57	BK	Speed Control Ground	SCGND
40	60	BK/LG	Power Ground	PWR GND

(Continued)

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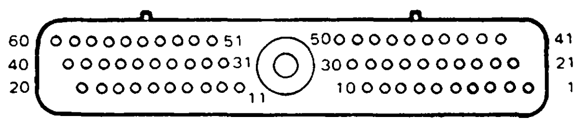
EEC-IV Module Connector Pin Usage

3.8L RWD SEFI

Pin	Circuit	Wire Color	Application	Abbreviations
43	95	T/R	Heated Exhaust Gas Oxygen Sensor - L	HEGO - L
44	695	BK/O	Data Communications Link +	DATA +
45	356	DB/LG	Manifold Absolute Pressure Sensor	MAP
46	359	BK/W	Signal Return	SIG/RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	209	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Sensor Ground	HEGO G
50	787	PK/BK	Fuel Pump Monitor	FPM
51	145	GY/BK	Speed Control Vacuum Solenoid	SCVAC
54	73	O/LB	W.O.T. A/C Cut Off	WAC
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	555	T	Injector #1	INJ 1
59	556	W	Injector #2	INJ 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definitions

3.8L RWD SEFI

SERVICE CODE		SERVICE CODE DEFINITION
11 orc	▶	System PASS
12 r	▶	Unable to control rpm to Self-Test upper limit band
13 r	▶	Unable to control rpm to Self-Test lower limit band
14 c	▶	PIP circuit failure
15 o	▶	ROM test failure
15 c	▶	Power interruption to Keep Alive Memory (KAM)
18 r	▶	SPOUT circuit open
18 c	▶	Loss of tach input to Processor/SPOUT circuit grounded
19 o	▶	Failure of EEC power supply
21 or	▶	ECT sensor input is out of Self-Test range
22 orc	▶	MAP sensor input is out of Self-Test range
23 or	▶	TP sensor input is out of Self-Test range
24 or	▶	ACT sensor input is out of Self-Test range
29 c	▶	Insufficient input from the Vehicle Speed Sensor (VSS)
31 orc	▶	PFE circuit is below minimum voltage
32 rc	▶	EGR valve not seated
33 rc	▶	EGR valve is not opening (PFE)
34 o	▶	Defective PFE sensor
34 rc	▶	Excessive exhaust back pressure
35 orc	▶	PFE circuit is above maximum voltage
41 r	▶	HEGO sensor circuit indicates system lean (right HEGO)
41 c	▶	No HEGO switching detected (right HEGO)
42 r	▶	HEGO sensor circuit indicates system rich (right HEGO)
51 oc	▶	ECT sensor input is greater than Self-Test maximum
53 oc	▶	TP sensor input is greater than Self-Test maximum
54 oc	▶	ACT sensor input is greater than Self-Test maximum
61 oc	▶	ECT sensor input is less than Self-Test minimum
63 oc	▶	TP sensor input is less than Self-Test minimum
64 oc	▶	ACT sensor input is less than Self-Test minimum
67 o	▶	Neutral Drive Switch (NDS) circuit open
74 r	▶	Brake On/Off (BOO) circuit failure — not actuated during test
79 o	▶	A/C on during Self-Test
84 o	▶	EGR Vacuum Regulator (EVR) circuit failure
85 o	▶	Canister Purge (CANP) circuit failure
87 oc	▶	Fuel pump primary circuit failure
91 r	▶	HEGO sensor circuit indicates system lean (left HEGO)
91 c	▶	No HEGO switching detected (left HEGO)
92 r	▶	HEGO sensor circuit indicates system rich (left HEGO)
95 oc	▶	Fuel pump secondary circuit failure
96 oc	▶	Fuel pump secondary circuit failure
98 r	▶	Hard fault is present
NO CODES	▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED	▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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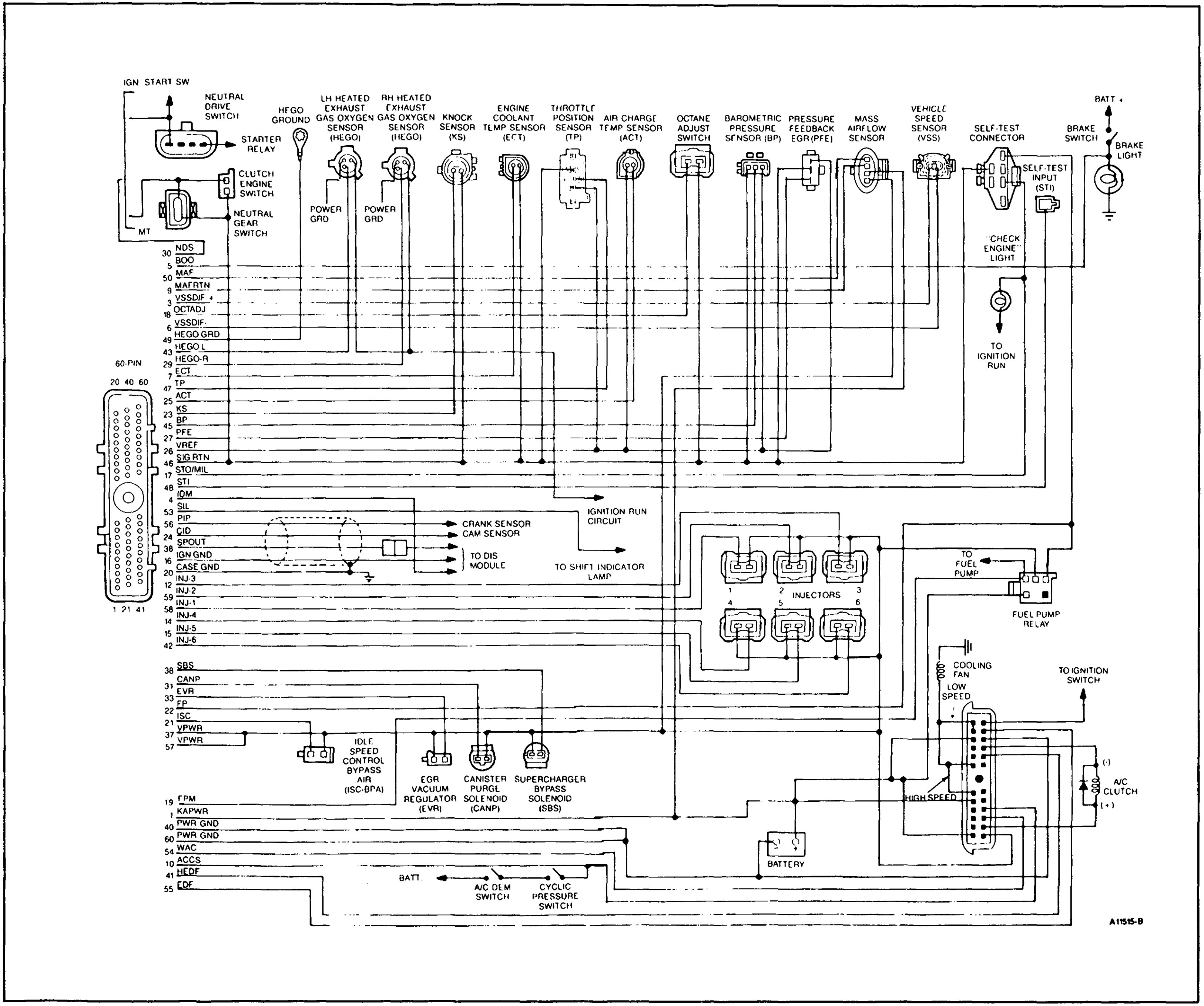
Electrical Schematic

3.8L SC SEFI



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EEC-IV Module Connector Pin Usage

3.8L SC SEFI

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
2	275	Y	A/C Pressure Cut-Off Switch	APCS
3	150	DG/W	Vehicle Speed Sensor +	VSS DIF +
4	11	DG/Y	Ignition Diagnostics Monitor	IDM
5	511	LG	Brake On/Off	BOO
6	359	BK/W	Vehicle Speed Sensor –	VSS DIF –
7	354	LG/Y	Engine Coolant Temperature Sensor	ECT
9	968	T/LB	Mass Air Signal Return	MAFRTN
10	883	PK/LB	A/C Clutch Signal	ACCS
11	144	O/Y	Vehicle Speed Control Solenoid	SOL +
12	557	BR/Y	Injector #3	INJ 3
13	558	BR/LB	Injector #4	INJ 4
14	559	T/LB	Injector #5	INJ 5
15	560	LG	Injector #6	INJ 6
16	796	LB	Ignition Ground	IGN GND
17	382	Y/BK	Self-Test Output/"Check Engine Light"	STO
18	359	BK/W	Octane Adjust	OCTADJ
19	787	PK/BK	Fuel Pump Monitor	FPM
20	57	BK	Case Ground	CASE GND
21	69	R/LG	Idle Speed Control	ISC
22	97	T/LG	Fuel Pump	FP
23	310	Y/R	Knock Sensor	KS
24	795	DG	Cylinder Identification Sensor	CID
25	357	LG/P	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	Pressure Feedback EGR	PFE
28	151	LB/BK	Speed Control Command Switch	SCCS
29	96	T/O	Heated Exhaust Gas Oxygen Sensor	HEGO #1
30	32	O/W	Neutral Drive Switch	NDS
31	101	GY/Y	Canister Purge	CANP
32	836	O/W	Air Suspension Control	ACL
33	360	Y	EGR Valve Regulator	EVR
35	146	W/PK	Speed Control Vent Solenoid	SCVNT

(Continued)

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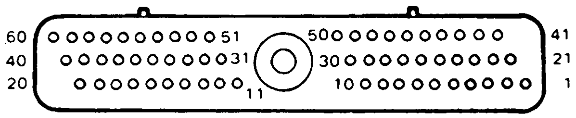
EEC-IV Module Connector Pin Usage

3.8L SC SEFI

Pin	Circuit	Wire Color	Application	Abbreviations
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
38	965	LG/P	Supercharger Bypass Solenoid	SBS
39	57	BK	Speed Control Command Switch Ground	SC GND
40	60	BK/LG	Power Ground	PWR GND
41	639	PK	High Electro Drive Fan	HEDF
43	95	T/R	Heated Exhaust Gas Oxygen Sensor - 2	HEGO #2
45	356	DB/LG	Barometric Pressure Sensor	BP
46	359	BK/W	Signal Return Ground	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	209	W/R	Self-Test Input	STI
49	89	O	HEGO Sensor Ground	HEGO GND
50	967	DB/O	Mass Air Flow Sensor	MAF
51	145	GY/BK	Speed Control Vacuum (Solenoid)	SCVAC
53	462	P	Shift Indicator Light	SIL
54	331	R	Wide Open Throttle A/C Cut Off	WAC
55	197	T/O	Electro-Drive Fan	EDF
56	349	DB	Profile Ignition Pick-up	PIP
57	361	R	Vehicle Power	VPWR
58	555	T	Injector #1	INJ 1
59	556	W	Injector #2	INJ 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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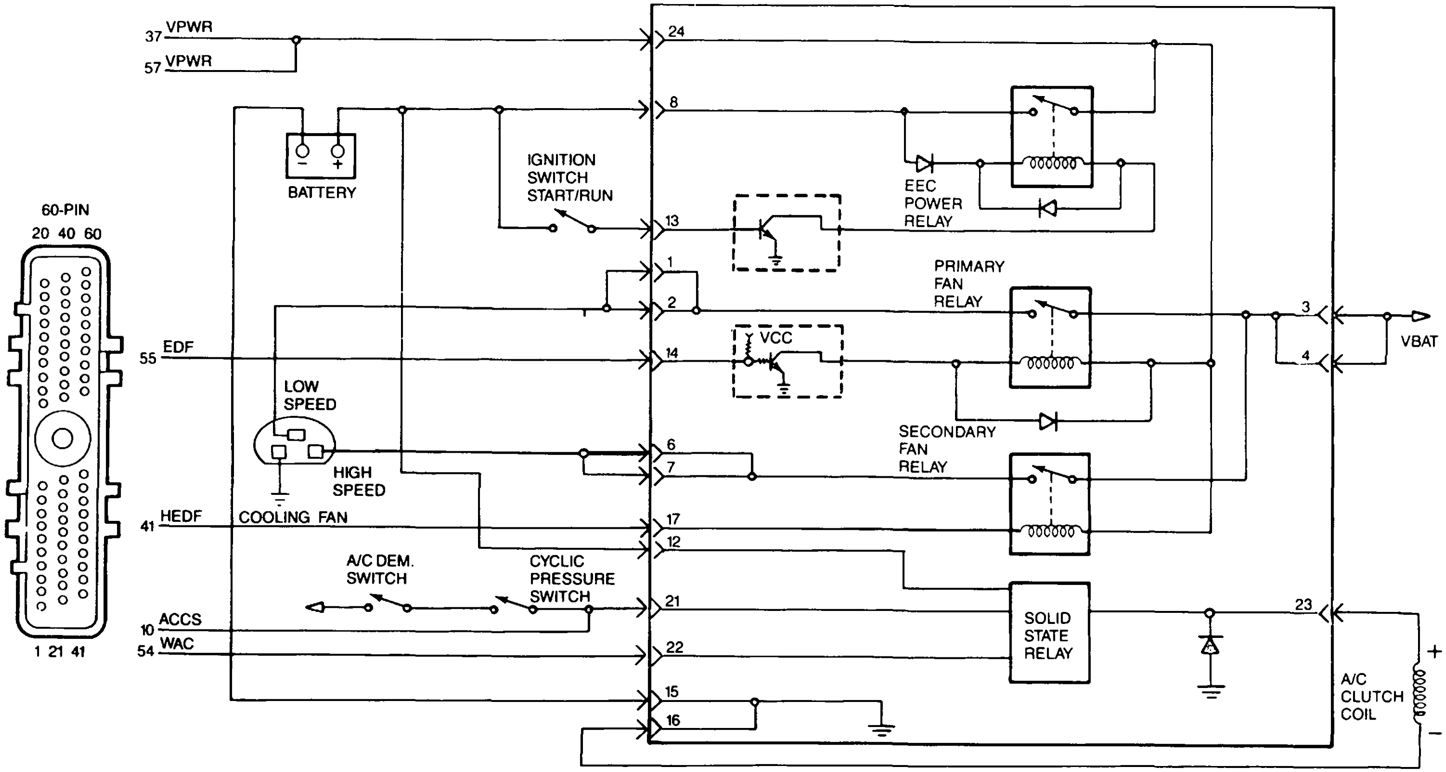
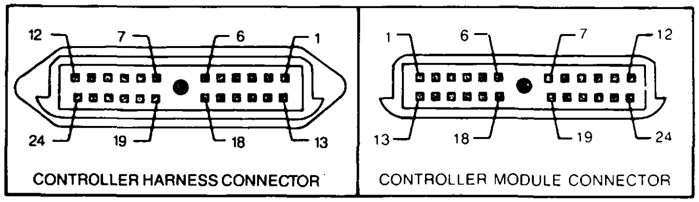
Electrical Schematic

3.8L SC SEFI



NOTE: FUEL PUMP RELAY LOCATED IN REAR OF VEHICLE.



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Integrated Controller Pin Usage

3.8L SC SEFI

Pin	Circuit	Color	Applications	Abbreviations
1	228	BR/O	Low Speed Fan	PT/EDF
2	228	BR/O	Low Speed Fan	PT/EDF
3	038	BR/Y	Vehicle Power	PTF
4	038	BR/Y	Vehicle Power	PTF
6	181	BK/O	High Speed Fan	PT/HEDF
7	181	BK/O	High Speed Fan	PT/HEDF
8	37	Y	Battery to EEC Relay	BATT +
12	175	BK/Y	Power to WOT A/C Cut Off	PT/WAC
13	16	R/LG	Key Power	KEY PWR
14	197	T/O	EDF Circuit	EDF
15	60	BK	Power Ground	PWR GRD
16	321	W/P	A/C Clutch Ground	PWR GRD
17	639	PK	HEDF Circuit	HEDF
21	883	PK/LB	A/C Cyclic Switch	ACCS
22	331	R	WOT A/C Cut Off	WAC
23	347	BK/Y	Power to A/C Clutch Coil	PTAC
24	361	R	Vehicle Power	VPWR

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Quick Test Codes and Code Definitions

3.8L
SC
SEFI

SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▷	System PASS
12 r ▷	Unable to control rpm to Self-Test upper limit band
13 r ▷	Unable to control rpm to Self-Test lower limit band
14 c ▷	PIP circuit failure
15 o ▷	ROM test failure
15 c ▷	Power interruption to Keep Alive Memory (KAM)
18 r ▷	SPOUT circuit open
18 c ▷	Loss of tach input to Processor/SPOUT circuit grounded
19 c ▷	CID sensor input failed
21 or ▷	ECT sensor input is out of Self-Test range
22 oc ▷	BP sensor input is out of Self-Test range
23 or ▷	TP sensor input is out of Self-Test range
24 or ▷	ACT sensor input is out of Self-Test range
25 r ▷	KS sensor signal is not sensed in Dynamic Response Test
26 or ▷	MAF sensor input is out of Self-Test range
29 c ▷	Insufficient input from the Vehicle Speed Sensor (VSS)
31 orc ▷	PFE circuit is below minimum voltage
32 rc ▷	EGR valve not seated
33 rc ▷	EGR valve is not opening (PFE)
34 o ▷	Defective PFE sensor
34 rc ▷	Excessive exhaust back pressure
35 orc ▷	PFE circuit is above maximum voltage
41 r ▷	HEGO sensor circuit indicates system lean (right HEGO)
41 c ▷	No HEGO switching detected (right HEGO)
42 r ▷	HEGO sensor circuit indicates system rich (right HEGO)
45 c ▷	DIS Coil pack 3 circuit failure
46 c ▷	DIS Coil pack 1 circuit failure
48 c ▷	DIS Coil pack 2 circuit failure
49 c ▷	SPOUT signal defaulted to 10 degrees BTDC
51 oc ▷	ECT sensor input is greater than Self-Test maximum
52 o ▷	PSPS circuit is open
52 r ▷	PSPS always staying open or closed
53 oc ▷	TP sensor input is greater than Self-Test maximum
54 oc ▷	ACT sensor input is greater than Self-Test maximum
56 oc ▷	MAF sensor input is greater than Self-Test maximum
61 oc ▷	ECT sensor input is less than Self-Test minimum
63 oc ▷	TP sensor input is less than Self-Test minimum
64 oc ▷	ACT sensor input is less than Self-Test minimum
66 c ▷	MAF sensor input is less than Self-Test minimum
67 o ▷	Neutral Drive Switch (NDS) circuit open; A/C input high
67 c ▷	Clutch switch circuit failure

(Continued)

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Quick Test Codes and Code Definitions

3.8L SC SEFI

SERVICE CODE	SERVICE CODE DEFINITION
72 r ▶	Insufficient BP output change during Dynamic Response Test
73 r ▶	Insufficient TP output change during Dynamic Response Test
74 r ▶	Brake On/Off (BOO) circuit failure — not actuated during test
77 r ▶	Brief WOT not sensed during Self-Test/Operator error
79 o ▶	A/C on during Self-Test
82 o ▶	Supercharger bypass circuit failure
83 o ▶	High speed electro-drive fan circuit failure
84 o ▶	EGR Vacuum Regulator (EVR) circuit failure
85 o ▶	Canister Purge (CANP) circuit failure
87 oc ▶	Fuel pump primary circuit failure
88 o ▶	Electro-Drive Fan (EDF) circuit failure
91 r ▶	HEGO sensor circuit indicates system lean (left HEGO)
91 c ▶	No HEGO switching detected (left HEGO)
92 r ▶	HEGO sensor circuit indicates system rich (left HEGO)
95 oc ▶	Fuel pump secondary circuit failure
96 oc ▶	Fuel pump secondary circuit failure
98 r ▶	Hard fault is present
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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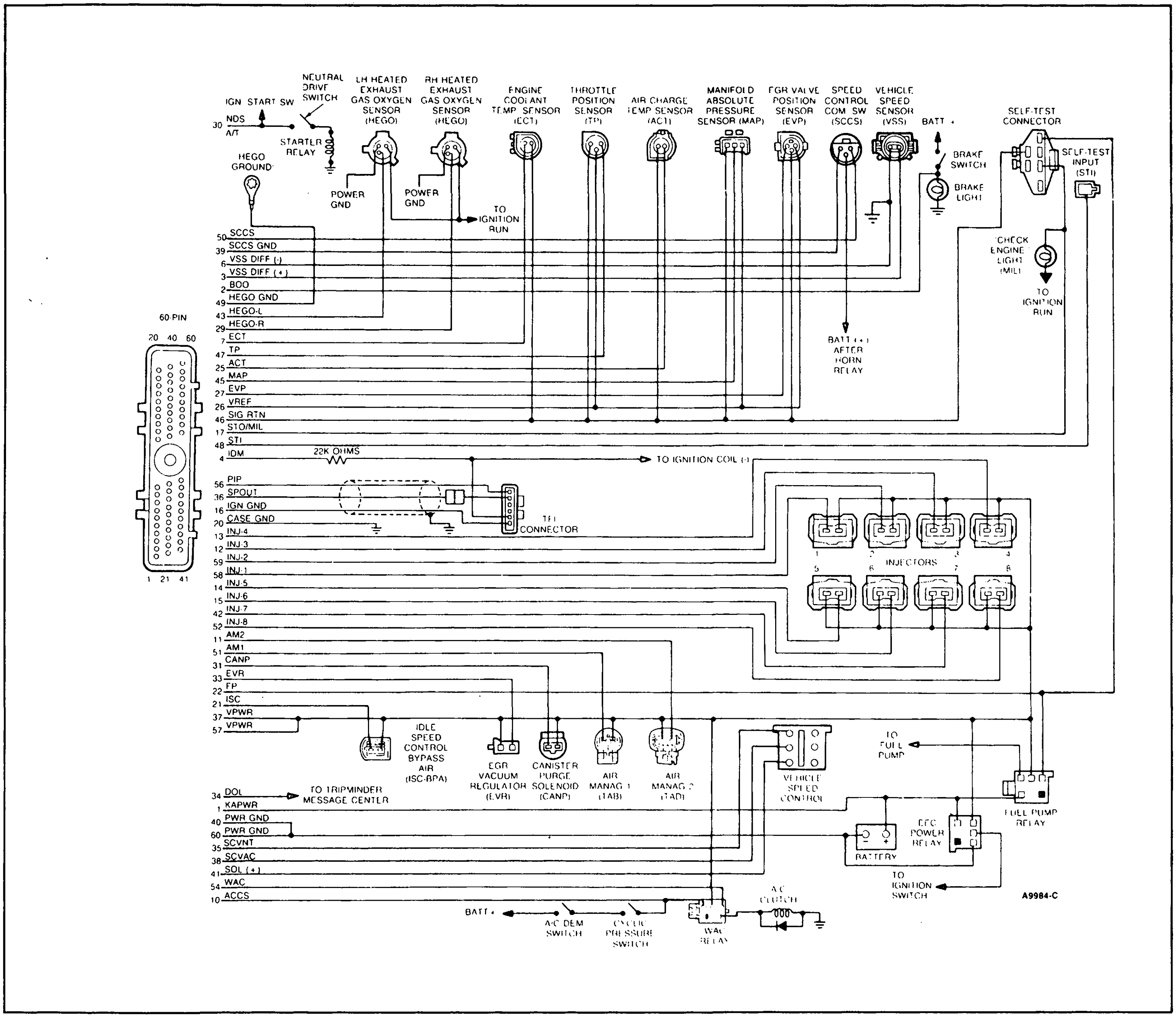
Electrical Schematic

5.0L SEFI

CROWN VICTORIA, GRAND MARQUIS, MARK VII, TOWN CAR



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EEC-IV Module Connector Pin Usage

5.0L SEFI

Pin	Car Lines				Application	Abbreviations
	Mark VII		Cr Vic, Gr Marq, Town Car			
	Crt.#	Wire Color	Crt.#	Wire Color		
1	38	BK/O	37	Y	Keep Alive Power	KAPWR
2	511	LG	511	LG	Brake On/Off	BOO
3	150	DG/W	150	DG/W	Vehicle Speed Sensor +	VSS DIF +
4	11	DG/Y	11	DG/Y	Ignition Diagnostic Monitor	IDM
6	683	P/LB	359	BK/W	Vehicle Speed Sensor –	VSS DIF –
7	354	LG/Y	354	LG/Y	Engine Coolant Temperature	ECT
10	348	LG/P	883	PK/LB	A/C Cycling Switch	ACCS
11	99	LG/BK	99	LG/BK	Air Management 2	AM2
12	557	BR/Y	557	BR/Y	Injector #3	INJ 3
13	558	BR/LB	558	BR/LB	Injector #4	INJ 4
14	559	T/LB	559	T/LB	Injector #5	INJ 5
15	560	LG	560	LG	Injector #6	INJ 6
16	259	BK/O	259	BK/O	Ignition Ground	IGN GND
17	382	Y/BK	201	T/R	Self-Test Output/"Check Engine" Light	STO/MIL
20	57	BK	57	BK	Case Ground	CASE GND
21	264	W/LB	264	W/LB	Idle Speed Control – Bypass Air	ISC – BPA
22	97	T/LG	97	T/LG	Fuel Pump	FP
25	357	LG/P	357	LG/P	Air Charge Temperature	ACT
26	351	O/W	351	O/W	Reference Voltage	VREF
27	352	BR/LG	352	BR/LG	EGR Valve Position Sensor	EVP
29	94	DG/P	94	DG/P	Heated Exhaust Gas Oxygen Sensor — Right	HEGO-R
30	33	W/PK	33	W/PK	Neutral Drive Switch	NDS
31	101	GY/Y	101	GY/Y	Canister Purge	CANP
33	360	DG	360	DG	EGR Valve Regulator	EVR
34	305	LB/PK	305	LB/PK	Data Output Line	DOL
35	146	W/PK	146	W/PK	Speed Control Vent (Solenoid)	SCVNT
36	324	Y/LG	324	Y/LG	Spark Output	SPOUT
37	361	R	361	R	Vehicle Power	VPWR
38	145	GY/BK	916	LG	Speed Control Vacuum (Solenoid)	SCVAC
39	199	LB/Y	679	GY/BK	Speed Control Command Switch Ground	SCCS GND
40	60	BK/LG	60	BK/LG	Power Ground	PWR GND

(Continued)

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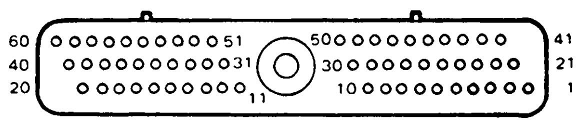
EEC-IV Module Connector Pin Usage

5.0L SEFI

	Car Lines					
	Mark VII		Cr Vic, Gr Marq, Town Car			
Pin	Crt.#	Wire Color	Crt.#	Wire Color	Application	Abbreviations
41	144	O/Y	144	O/Y	Vehicle Speed Control Solenoid	SOL +
42	561	T/O	561	T/O	Injector #7	INJ 7
43	90	DB/LG	90	DB/LG	Heated Exhaust Gas Oxygen Sensor — Left	HEGO-L
45	356	DB/LG	358	LG/BK	Manifold Absolute Pressure Sensor	MAP
46	359	BK/W	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	355	DG/LG	Throttle Position Sensor	TP
48	209	W/R	200	W/BK	Self-Test Input	STI
49	89	O	89	O	Heated EGO Ground	HEGO GND
50	151	LB/PK	151	LB/BK	Speed Control Command Switch	SCCS
51	100	W/R	100	W/R	Air Management 1	AM1
52	562	LB	562	LB	Injector #8	INJ 8
54	73	O/LB	73	O/LB	Wide Open Throttle A/C Cut Off	WAC
56	349	DB	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	361	R	Vehicle Power	VPWR
58	555	T	555	T	Injector #1	INJ 1
59	556	W	556	W	Injector #2	INJ 2
60	60	BK/LG	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definitions

5.0L SEFI

SERVICE CODE		SERVICE CODE DEFINITION
11	orc ▶	System PASS
12	r ▶	Unable to control rpm to Self-Test upper limit band
13	r ▶	Unable to control rpm to Self-Test lower limit band
14	c ▶	PIP circuit failure
15	o ▶	ROM test failure
15	c ▶	Power interruption to Keep Alive Memory (KAM)
16	r ▶	RPM too low to perform fuel test
18	r ▶	SPOUT circuit open
18	c ▶	Loss of tach input to Processor/SPOUT circuit grounded
19	o ▶	Failure of EEC power supply
21	or ▶	ECT sensor input is out of Self-Test range
22	orc ▶	MAP sensor input is out of Self-Test range
23	or ▶	TP sensor input is out of Self-Test range
24	or ▶	ACT sensor input is out of Self-Test range
29	c ▶	Insufficient input from the Vehicle Speed Sensor (VSS)
31	orc ▶	EVP circuit is below minimum voltage
32	orc ▶	EVP voltage is below closed limit (SONIC)
33	rc ▶	EGR valve is not opening (SONIC)
34	orc ▶	EVP voltage is above closed limit (SONIC)
35	orc ▶	EVP circuit is above maximum voltage
41	r ▶	HEGO sensor circuit indicates system lean (right HEGO)
41	c ▶	No HEGO switching detected (right HEGO)
42	r ▶	HEGO sensor circuit indicates system rich (right HEGO)
44	r ▶	Thermactor air system inoperative (cyl. 1-4)
45	r ▶	Thermactor air upstream during Self-Test
46	r ▶	Thermactor air not bypassed during Self-Test
51	oc ▶	ECT sensor input is greater than Self-Test maximum
53	oc ▶	TP sensor input is greater than Self-Test maximum
54	oc ▶	ACT sensor input is greater than Self-Test maximum
61	oc ▶	ECT sensor input is less than Self-Test minimum
63	oc ▶	TP sensor input is less than Self-Test minimum
64	oc ▶	ACT sensor input is less than Self-Test minimum
67	o ▶	Neutral Drive Switch (NDS) circuit open
74	r ▶	Brake On/Off (BOO) circuit open — not actuated during test
75	r ▶	Brake On/Off (BOO) circuit closed - always high
79	o ▶	A/C on during Self-Test
81	o ▶	Air Management 2 (AM2) circuit failure
82	o ▶	Air Management 1 (AM1) circuit failure
84	o ▶	EGR Vacuum Regulator (EVR) circuit failure
85	o ▶	Canister Purge (CANP) circuit failure
87	oc ▶	Fuel pump primary circuit failure
91	r ▶	HEGO sensor circuit indicates system lean (left HEGO)
91	c ▶	No HEGO switching detected (left HEGO)
92	r ▶	HEGO sensor circuit indicates system rich (left HEGO)
94	r ▶	Thermactor air system inoperative (cyl. 5-8)
98	r ▶	Hard fault is present
NO CODES	▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED	▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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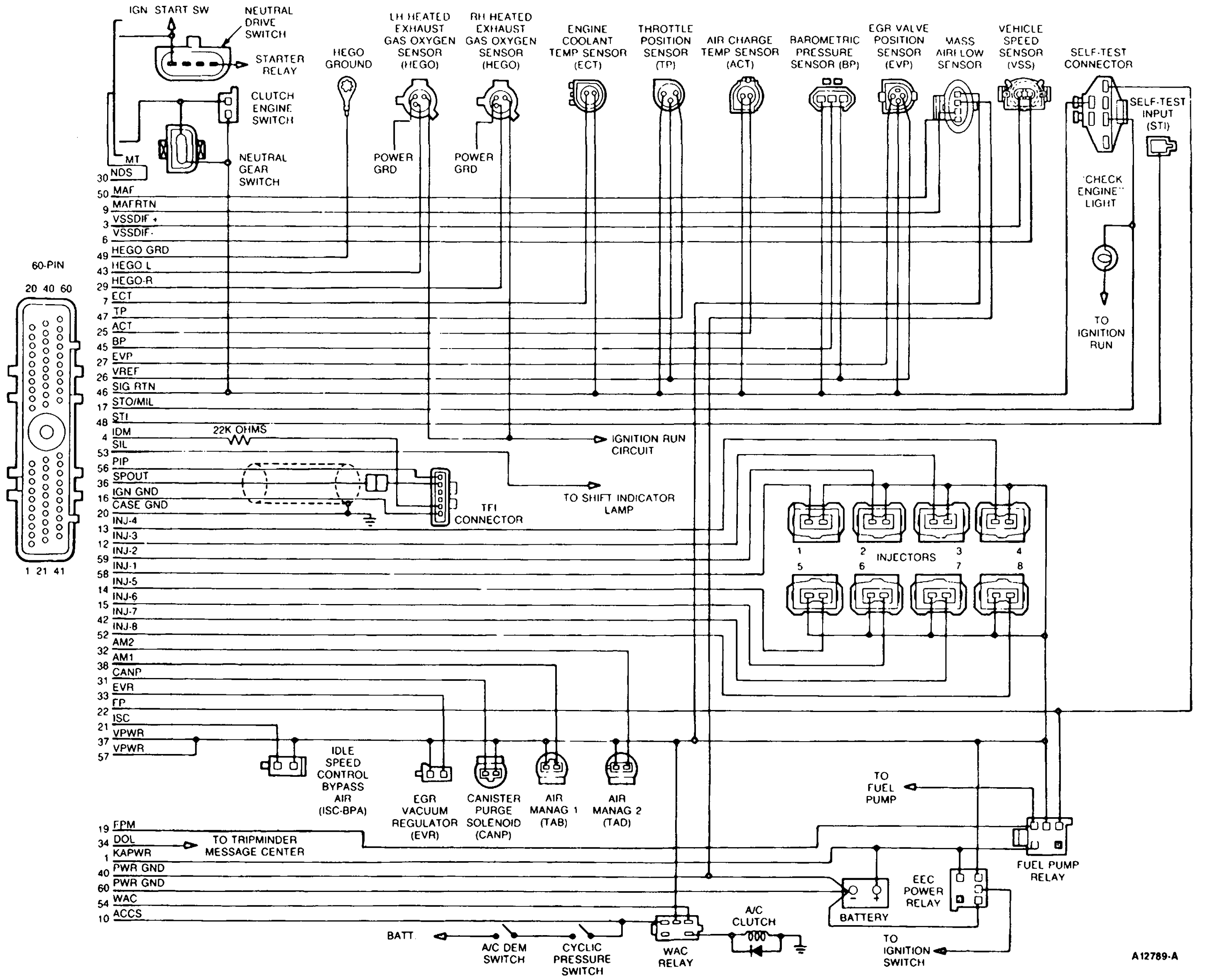
Electrical Schematic

EEC-IV — Engine Supplement — Passenger Car

5.0L MA SEFI



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EEC-IV Module Connector Pin Usage

5.0L MA SEFI

5.0L MASS AIR SEFI MUSTANG

Pin	Circuit	Wire Color	Application	Abbreviations
1	38	BK/O	Keep Alive Power	KAPWR
3	150	DG/W	Vehicle Speed Sensor +	VSS +
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
6	563	O/Y	Vehicle Speed Sensor —	VSS -
7	354	LG/Y	Engine Coolant Temperature	ECT
9	968	T/LB	Mass Air Signal Return	MAF RTN
10	883	PK/LB	A/C Clutch Signal	ACCS
12	557	BR/Y	Fuel Injector #3	INJ 3
13	558	BR/LB	Fuel Injector #4	INJ 4
14	559	T/LB	Fuel Injector #5	INJ 5
15	560	LG	Fuel Injector #6	INJ 6
16	259	BK/O	Ignition Ground	IGN GND
17	657	T	Self-Test Out and Malfunction Light	STO and MIL
19	787	PK/BK	Fuel Pump Monitor	FPM
20	57	BK	Case Ground	CASE GND
21	264	W/LB	Idle Speed Control Bypass Air	ISC-BPA
22	97	T/LG	Fuel Pump	FP
25	357	LG/P	Air Charge Temp	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position Sensor	EVP
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	R-HEGO
30	199	LB/Y	Neutral Gear SW. M.T.	NGS
30	33	W/PK	Neutral Drive With Automatics	NDS
31	101	GY/Y	Canister Purge	CANP
32	99	LG/BK	Thermactor Air Diverter (AM2)	TAD
33	360	DG	EGR Valve Regulator	EVR
36	324	Y/LG	Spark Out	SPOUT
37	361	R	Vehicle Power	VPWR
38	100	W/R	Thermactor Air Bypass (AM1)	TAB
40	60	BK/W	Power Ground	PWR GND

(Continued)

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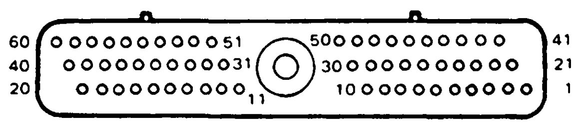
EEC-IV Module Connector Pin Usage

5.0L MA SEFI

5.0L MASS AIR SEFI MUSTANG

Pin	Circuit	Wire Color	Application	Abbreviations
42	561	T/O	Fuel Injector #7	INJ 7
43	90	DB/LG	Heated Exhaust Gas Oxygen Sensor	L-HEGO
45	358	LG/BK	Barometric Pressure Sensor	BP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TPS
48	201	T/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Sensor Ground	HEGO GND
50	967	DB/O	Mass Air Flow	MAF
52	562	L/B	Fuel Injector #8	INJ 8
54	73	O/LB	W.O.T. A/C Cut Off	WOT A/C
56	349	DB	Profile Ignition Pick Up	PIP
57	361	R	Vehicle Power	VPWR
58	555	T	Fuel Injector #1	INJ 1
59	556	W	Fuel Injector #2	INJ 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definitions

5.0L MA SEFI

SERVICE CODE		SERVICE CODE DEFINITION
11	orc ▶	System PASS
12	r ▶	Unable to control rpm to Self-Test upper limit band
13	r ▶	Unable to control rpm to Self-Test lower limit band
14	c ▶	PIP circuit failure
15	o ▶	ROM test failure
15	c ▶	Power interruption to Keep Alive Memory (KAM)
18	r ▶	SPOUT circuit open
18	c ▶	Loss of tach input to Processor/SPOUT circuit grounded
19	o ▶	Failure of EEC power supply
21	or ▶	ECT sensor input is out of Self-Test range
22	oc ▶	BP sensor input is out of Self-Test range
23	or ▶	TP sensor input is out of Self-Test range
24	or ▶	ACT sensor input is out of Self-Test range
26	or ▶	MAF sensor input is out of Self-Test range
29	c ▶	Insufficient input from the Vehicle Speed Sensor (VSS)
31	orc ▶	EVP circuit is below minimum voltage
32	orc ▶	EVP voltage is below closed limit (SONIC)
33	rc ▶	EGR valve not opening (SONIC)
34	orc ▶	EVP voltage is above closed limit (SONIC)
35	orc ▶	EVP circuit is above maximum voltage
41	r ▶	HEGO sensor circuit indicates system lean (right HEGO)
41	c ▶	No HEGO switching detected (right HEGO)
42	r ▶	HEGO sensor circuit indicates system rich (right HEGO)
44	r ▶	Thermactor air system inoperative (cylinders 1-4)
45	r ▶	Thermactor air upstream during Self-Test
46	r ▶	Thermactor air not bypassed during Self-Test
51	oc ▶	ECT sensor input is greater than Self-Test maximum
53	oc ▶	TP sensor input is greater than Self-Test maximum
54	oc ▶	ACT sensor input is greater than Self-Test maximum
56	oc ▶	MAF sensor input is greater than Self-Test maximum
61	oc ▶	ECT sensor input is less than Self-Test minimum
63	oc ▶	TP sensor input is less than Self-Test minimum
64	oc ▶	ACT sensor input is less than Self-Test minimum
66	c ▶	MAF sensor input is less than Self-Test minimum
67	o ▶	Neutral Drive Switch (NDS) circuit open; A/C input high
77	r ▶	Brief WOT not sensed during Self-Test/Operator error
79	o ▶	A/C on during Self-Test
81	o ▶	Air Management 2 (AM2) circuit failure
82	o ▶	Air Management 1 (AM1) circuit failure
84	o ▶	EGR Vacuum Regulator (EVR) circuit failure
85	o ▶	Canister Purge (CANP) circuit failure
87	oc ▶	Fuel pump primary circuit failure
91	r ▶	HEGO sensor circuit indicates system lean (left HEGO)
91	c ▶	No HEGO switching detected (left HEGO)
92	r ▶	HEGO sensor circuit indicates system rich (left HEGO)
94	r ▶	Thermactor air system inoperative (cylinders 5-8)
95	oc ▶	Fuel pump secondary circuit failure
96	oc ▶	Fuel pump secondary circuit failure
98	r ▶	Hard fault is present
NO CODES	▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED	▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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SECTION 16

EEC-IV—Engine Supplement — Light Truck

Contents

(Continued)

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SECTION 16

EEC-IV—Engine Supplement — Light Truck

Contents

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Diagnostic Sensor/Actuator Reference Values

Truck

NOTE:

- The chart below contains typical component values.
- Values measured in the field may differ slightly from those shown.
- Do not compare reference values found on this chart with monitor-box data. Monitor-box data is measured with respect to a different reference level in some cases.
- Breakout box pin number assignments differ from vehicle to vehicle. Refer to the Pin Usage Chart applicable to the vehicle being serviced for the correct pin assignments.
- Each vehicle application will not have all components listed below.
- Pre-condition the engine in the following manner before recording any observations:
- The engine should be at a normal operating condition.
- Start and run engine at 2000 rpm for two minutes.

	INPUTS	Breakout Box Pin Numbers (+)	(-)	KEY OFF Throttle Closed (ohms)	Key On Eng. Off (volts)	Hot Idle (volts)
*	Engine Coolant Temperature (ECT) ①	7	46	3.6 K to 1.7 K	—	0.74 to 0.31
	Throttle Position (TP)	47	46	0.5 K to 1.2 K	0.7 to 1.3	0.7 to 1.3
	Pressure Feedback EGR (PFE)	27	46	—	3.0 to 3.5	3.0 to 3.5
	EGR Valve Position (EVP)	27	46	480 K to 650K	0.30 to 0.45	0.30 to 0.45
*	Power Steering Pressure Switch (PSPS) ②	24	46	—	—	—
	(Heated) Exhaust Gas Oxygen (H) EGO	29	46	> 1.5 M	< 0.4	0.0 to 0.9
	Coil Tach Signal (IDM)	4	16	21.8 K	8.0 to 10.0	8.0 to 12.0
*	Distributor Position (PIP) ③	56	16	1.1 K to 2.1 K	—	3.0 to 7.0
*	Neutral/Drive Switch (NDS) ④	30	40	—	—	—
*	Clutch Engage Switch (CES) ⑤	30	40	—	—	—
	Reference Voltage (VREF)	26	46	—	5.0	5.0
*	Vehicle Speed Sensor (VSS) ⑥	3	6	190.0 240.0	—	—
*	Knock Sensor (KS) ⑦	23	46	4.5 K to 6.5 K	—	—
*	Manifold Pressure (MAP) Barometric Pressure (BP) ⑧	45	46	—	—	—
	OUTPUTS					
	Idle Speed Motor (ISC)	37	21	10.3	0.0 (OFF)	3.0 to 5.0
	Fuel Pump Relay (FP)	37	22	—	0.0 (OFF)	VBAT (ON)
*	Injectors Bank #1 ⑨	37	58	—	0.0	—
*	Injectors Bank #2 ⑨	37	59	—	0.0	—
	Computed Spark Advance (DIS)	36	16	—	9.0 to 12.5	8.5 to 9.5
	Computed Spark Advance (TFI)	36	16	—	0.0	5.0 to 7.0
	EGR Valve Regulator (EVR)	37	33	40.0 to 50.0	0.0 (OFF)	0.0 (OFF)

*** Numbers to the right of these inputs/outputs refer to explanations on next page.**

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Diagnostic Sensor/Actuator Reference Values

Truck

Explanations —

1. Engine coolant temperature must be within the 180-240°F (82-116°C) temperature range before measurements are taken.
2. If power steering pressure rises above a specified limit, the switch contacts will open and the ECA will adjust idle speed to compensate for the extra load placed on the engine.
3. For applications containing TFI-IV systems only.
4. The NDS is open in any gear, but closed in neutral or park.
5. If the clutch is pedal down, the switch is closed. If the clutch is pedal up, the switch is open.
6. If vehicle is not moving, the speed sensor output to the processor will be zero. The vehicle must be moving for the speed sensor to provide information to the processor.
7. The Knock Sensor output voltage is a variable signal of 300 mV or greater, depending on the severity of engine knock; background noise is not part of the sensor output.
8. Refer to the Altitude vs. Voltage Chart in Pinpoint Test DF, Section 17 for proper operating values.
9. Refer to the Injector Resistance Chart in Pinpoint Test H, Section 17 for the proper resistance values.

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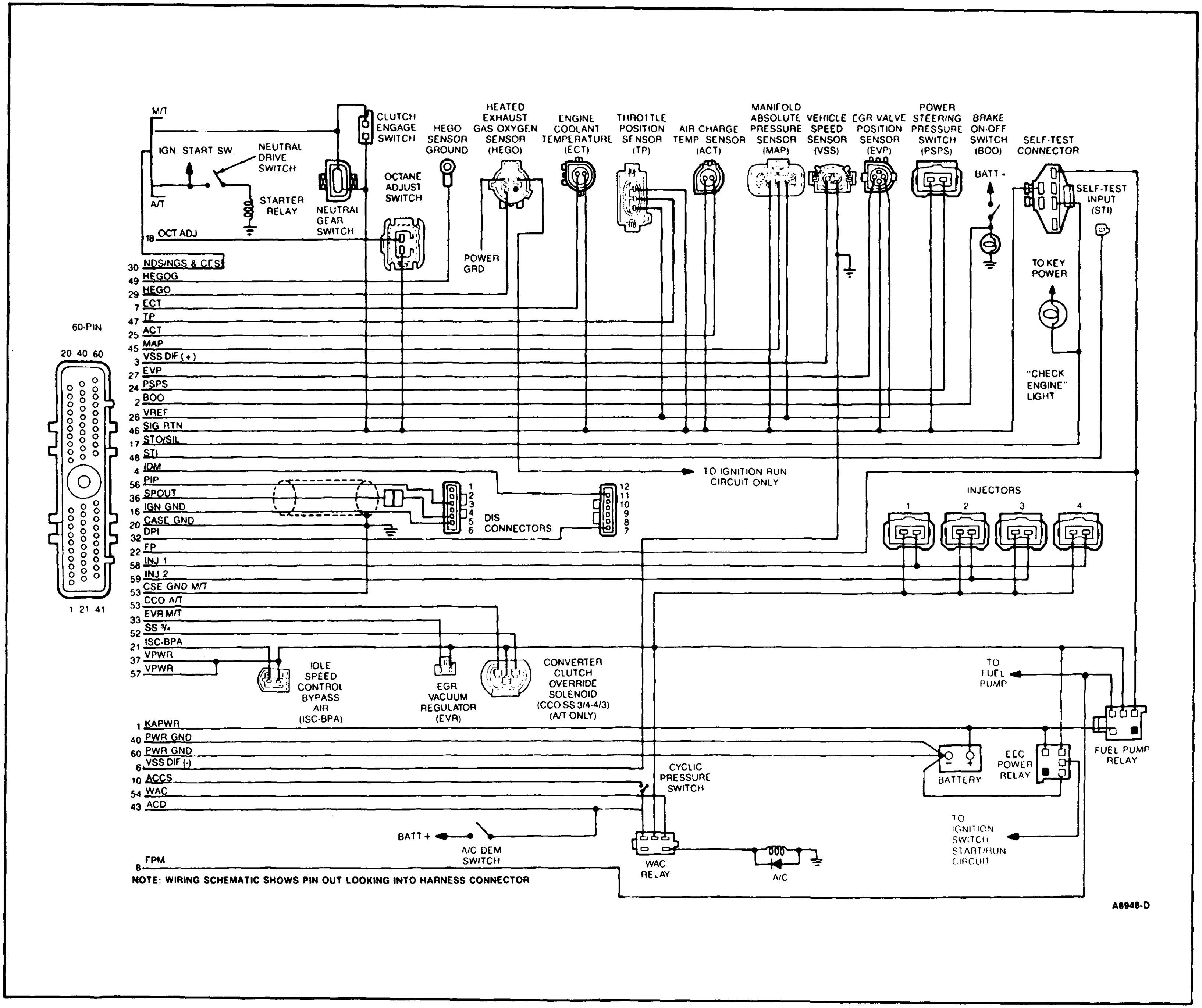
Electrical Schematic

2.3L EFI



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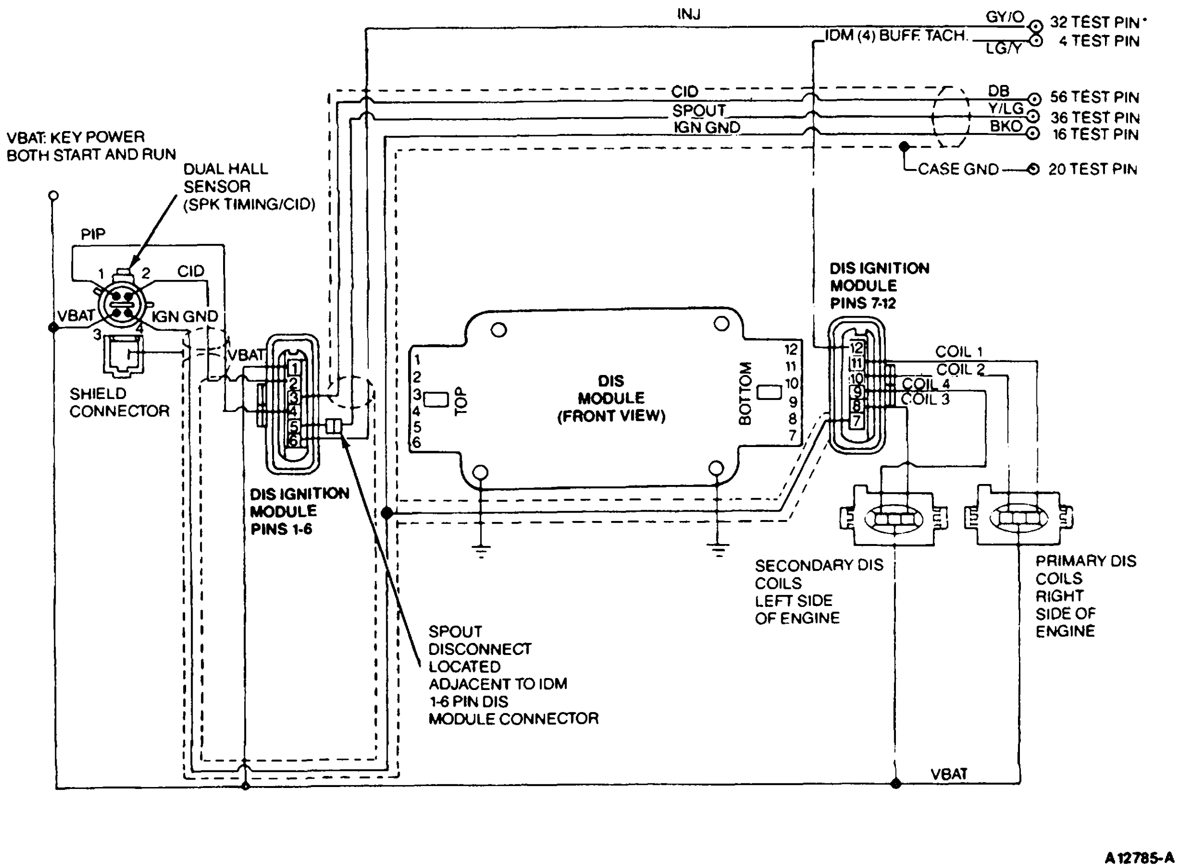
Distributorless Ignition System (DIS) Electrical Schematic

2.3L EFI

2.3 EFI



* TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

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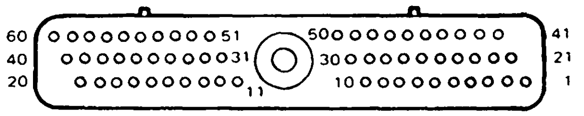
EEC-IV Module Connector Pin Usage

2.3L EFI

RANGER/BRONCO II

Pin	Circuit	Wire Color	Application	Abbreviations
1	554	Y/BK	Keep Alive Power	KAPWR
2	511	LG	Brake On/Off	BOO
3	150	DG/W	Vehicle Speed Sensor +	VSS +
4	348	LG/P	Ignition Diagnostic Monitor	IDM
6	397	BK/W	Vehicle Speed Sensor –	VSS –
7	354	LG/Y	Engine Coolant Temperature	ECT
8	238	O/LB	Fuel Pump Monitor	FPM
10	198	T/Y	A/C Cycle Pressure Switch	ACCS
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output	STO
18	240	W/R	Octane Adjust Switch	OCT ADJ
20	57	BK	Case Ground	CSE GND
21	67	GY/W	Idle Speed Control (Bypass Air)	ISC-BPA
22	97	T/LG	Fuel Pump	FP
24	150	DG/W	Power Steering Pressure Switch	PSPS
25	310	Y/R	Air Charge Temperature	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position	EVP
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	614	GY/O	Neutral Drive Switch (A/T Only)	NDS
30	200	W/BK	Neutral Gear Switch and Clutch Engage Switch (M/T Only)	NGS/CES
32	395	GY/O	Dual Plug Inhibit	DPI
33	360	DG	Exhaust Gas Recirculation Valve Regulator (M/T Only)	EVR
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
40	60	BK/LG	Power Ground	PWR GND
43	348	LG/P	A/C Demand	ACD
45	356	DB/LG	Manifold Absolute Pressure	MAP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Sensor Ground	HEGOG
52	229	T/LB	Shift Solenoid	SS 3/4
53	332	W	Clutch Converter Override (A/T Only)	CCO
53	332	W	Case Ground (M/T Only)	CSE GND
54	462	P	W.O.T. A/C Cut Off	WAC
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	265	LG/W	Injector (Bank 1)	INJ 1
59	95	T/R	Injector (Bank 2)	INJ 2
60	60	BK/LG	Power Ground	PWR GRD

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definitions

2.3L EFI

SERVICE CODE		SERVICE CODE DEFINITION
11	orc	▶ System PASS
12	r	▶ Unable to control rpm to Self-Test upper limit band
13	r	▶ Unable to control rpm to Self-Test lower limit band
14	c	▶ PIP circuit failure
15	o	▶ ROM test failure
15	c	▶ Power interruption to Keep Alive Memory (KAM)
18	r	▶ SPOUT circuit open
18	c	▶ Erratic input to processor
19	o	▶ Failure of EEC power supply
21	or	▶ ECT sensor input is out of Self-Test range
22	orc	▶ MAP sensor input is out of Self-Test range
23	or	▶ TP sensor input is out of Self-Test range
24	or	▶ ACT sensor input is out of Self-Test range
28	c	▶ Loss of primary tach — right side
29	c	▶ Insufficient input from the Vehicle Speed Sensor (VSS)
31	orc	▶ EVP circuit is below minimum voltage
32	orc	▶ EVP voltage is below closed limit (SONIC)
33	rc	▶ EGR valve is not opening (SONIC)
34	orc	▶ EVP voltage is above closed limit (SONIC)
35	orc	▶ EVP circuit is above maximum voltage
41	r	▶ HEGO sensor circuit indicates system lean
41	c	▶ No HEGO switching detected
42	r	▶ HEGO sensor circuit indicates system rich
48	c	▶ Loss of secondary tach — left side
51	oc	▶ ECT sensor input is greater than Self-Test maximum
52	o	▶ PSPS circuit is open
52	r	▶ PSPS always staying open or closed
53	oc	▶ TP sensor input is greater than Self-Test maximum
54	oc	▶ ACT sensor input is greater than Self-Test maximum
61	oc	▶ ECT sensor input is less than Self-Test minimum
63	oc	▶ TP sensor input is less than Self-Test minimum
64	oc	▶ ACT sensor input is less than Self-Test minimum
67	o	▶ Neutral Drive Switch (NDS) circuit open; A/C input high
72	r	▶ Insufficient MAP output change during Dynamic Response Test
73	r	▶ Insufficient TP output change during Dynamic Response Test
74	r	▶ Brake On/Off (BOO) circuit failure — not actuated during test
77	r	▶ Brief WOT not sensed during Self-Test/Operator error
84	o	▶ EGR Vacuum Regulator (EVR) circuit failure
86	o	▶ 3-4 Shift Solenoid circuit failure
87	oc	▶ Fuel pump primary circuit failure
88	c	▶ Loss of Dual Plug Input control
89	o	▶ Clutch Converter Override (CCO) circuit failure
95	oc	▶ Fuel pump secondary circuit failure
96	oc	▶ Fuel pump secondary circuit failure
98	r	▶ Hard fault is present
NO CODES		▶ Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED		▶ Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running c = Continuous Memory

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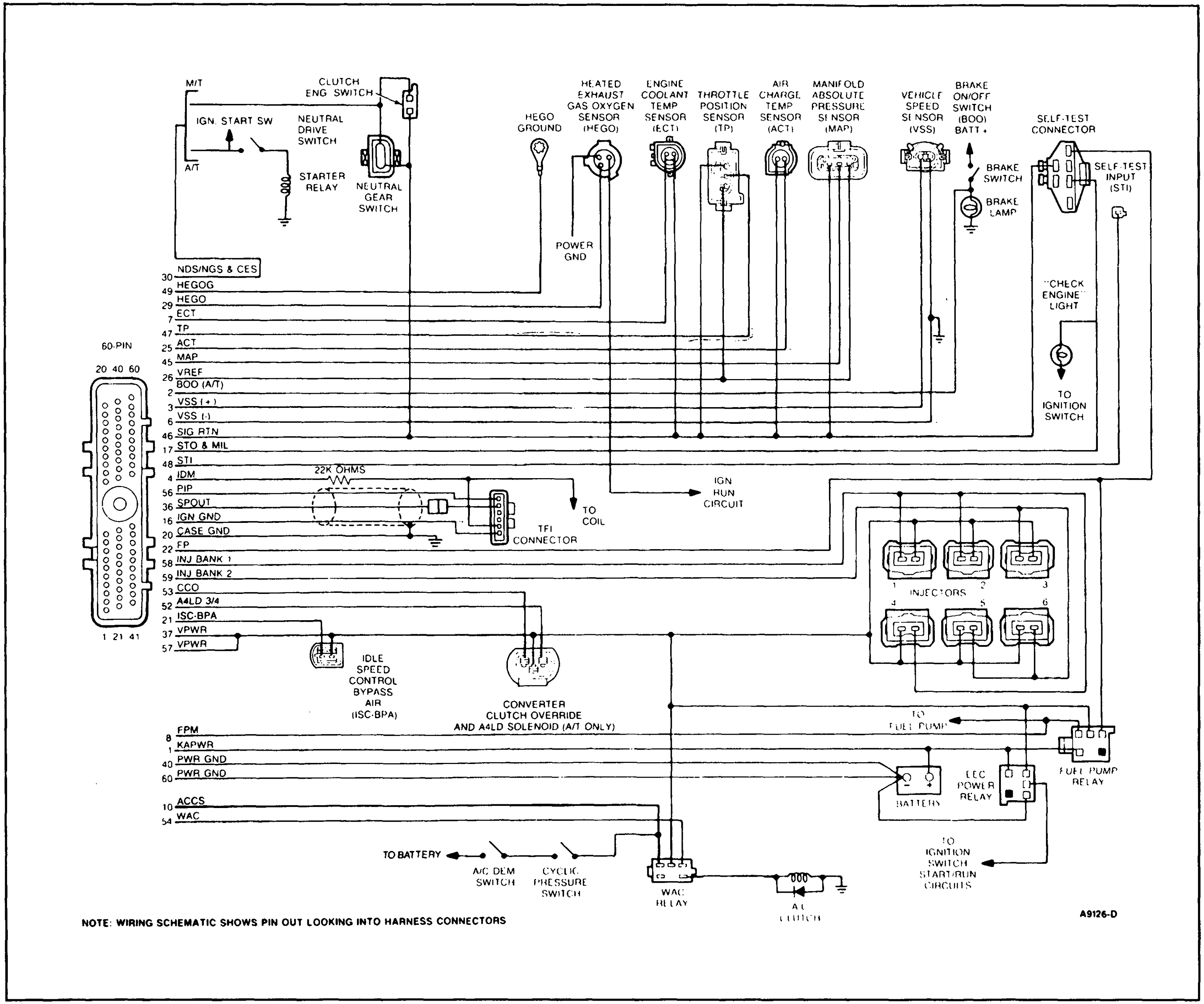
Electrical Schematic

2.9L EFI



NOTE: WIRING SCHEMATIC SHOWS PIN OUT LOOKING INTO HARNESS CONNECTORS

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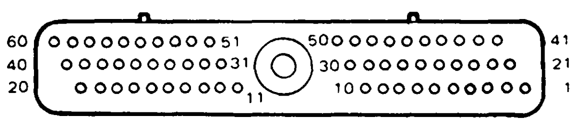
EEC-IV Module Connector Pin Usage

2.9L EFI

Pin	Circuit	Wire Color	Application	Abbreviations
1	554	Y/BK	Keep Alive Power	KAPWR
2	511	LG	Brake On-Off (A/T only)	BOO
3	150	DG/W	Vehicle Speed Sensor +	VSS+
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
6	397	BK/W	Vehicle Speed Sensor –	VSS–
7	354	LG/Y	Engine Coolant Temp. Sensor	ECT
8	238	O/LB	Fuel Pump Monitor	FPM
10	198	T/Y	A/C Cycle Pressure Switch	ACCS
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output and "Check Engine" Light	STO and MIL
20	57	BK	Case Ground	CASE GND
21	67	GY/W	Idle Speed Control (Bypass Air)	ISC-BPA
22	97	T/LG	Fuel Pump	FP
25	357	LG/P	Air Charge Temp. Sensor	ACT
26	351	O/W	Reference Voltage	VREF
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	200	W/BK	Neutral Drive Switch (A/T Only)	NDS
30	200	W/BK	Neutral Gear Switch and Clutch Engage Switch (M/T Only)	NGS/CES
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
40	60	BK/LG	Power Ground	PWR GND
45	356	DB/LG	Manifold Absolute Pressure Sensor	MAP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Sensor Ground	HEGOG
52	224	T/LB	Automatic 4 Speed Lock Drive (3-4 Shift)	A4LD 3/4
53	332	W	Clutch Converter Override (A/T Only)	CCO
54	462	P	W.O.T. A/C Cut-Off	WAC
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	265	LG/W	Injector (Bank 1 Controls Engine Cylinder Numbers 1, 2 and 4)	INJ Bank 1
59	95	T/R	Injector (Bank 2 Controls Engine Cylinder Numbers 3, 5 and 6)	INJ Bank 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definition

2.9L EFI

SERVICE CODE		SERVICE CODE DEFINITION
11 orc	▶	System PASS
12 r	▶	Unable to control rpm to Self-Test upper limit band
13 r	▶	Unable to control rpm to Self-Test lower limit band
14 c	▶	PIP circuit failure
15 o	▶	ROM test failure
15 c	▶	Power interruption to Keep Alive Memory (KAM)
18 r	▶	SPOUT circuit open
18 c	▶	Loss of tach input to Processor/SPOUT circuit grounded
19 o	▶	Failure of EEC power supply
21 or	▶	ECT sensor input is out of Self-Test range
22 orc	▶	MAP sensor input is out of Self-Test range
23 or	▶	TP sensor input is out of Self-Test range
24 or	▶	ACT sensor input is out of Self-Test range
29 c	▶	Insufficient input from the Vehicle Speed Sensor (VSS)
41 r	▶	HEGO sensor circuit indicates system lean
41 c	▶	No HEGO switching detected
42 r	▶	HEGO sensor circuit indicates system rich
51 oc	▶	ECT sensor input is greater than Self-Test maximum
53 oc	▶	TP sensor input is greater than Self-Test maximum
54 oc	▶	ACT sensor input is greater than Self-Test maximum
61 oc	▶	ECT sensor input is less than Self-Test minimum
63 oc	▶	TP sensor input is less than Self-Test minimum
64 oc	▶	ACT sensor input is less than Self-Test minimum
67 o	▶	Neutral Drive Switch (NDS) circuit open; A/C input high
67 c	▶	Clutch Switch circuit failure
72 r	▶	Insufficient MAP output change during Dynamic Response Test
73 r	▶	Insufficient TP output change during Dynamic Response Test
74 r	▶	Brake On/Off (BOO) circuit open — not actuated during test
77 r	▶	Brief WOT not sensed during Self-Test/Operator error
86 o	▶	3-4 Shift Solenoid circuit failure
87 oc	▶	Fuel pump primary circuit failure
89 o	▶	Clutch Converter Override (CCO) circuit failure
95 oc	▶	Fuel pump secondary circuit failure
96 oc	▶	Fuel pump secondary circuit failure
98 r	▶	Hard fault is present
NO CODES	▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED	▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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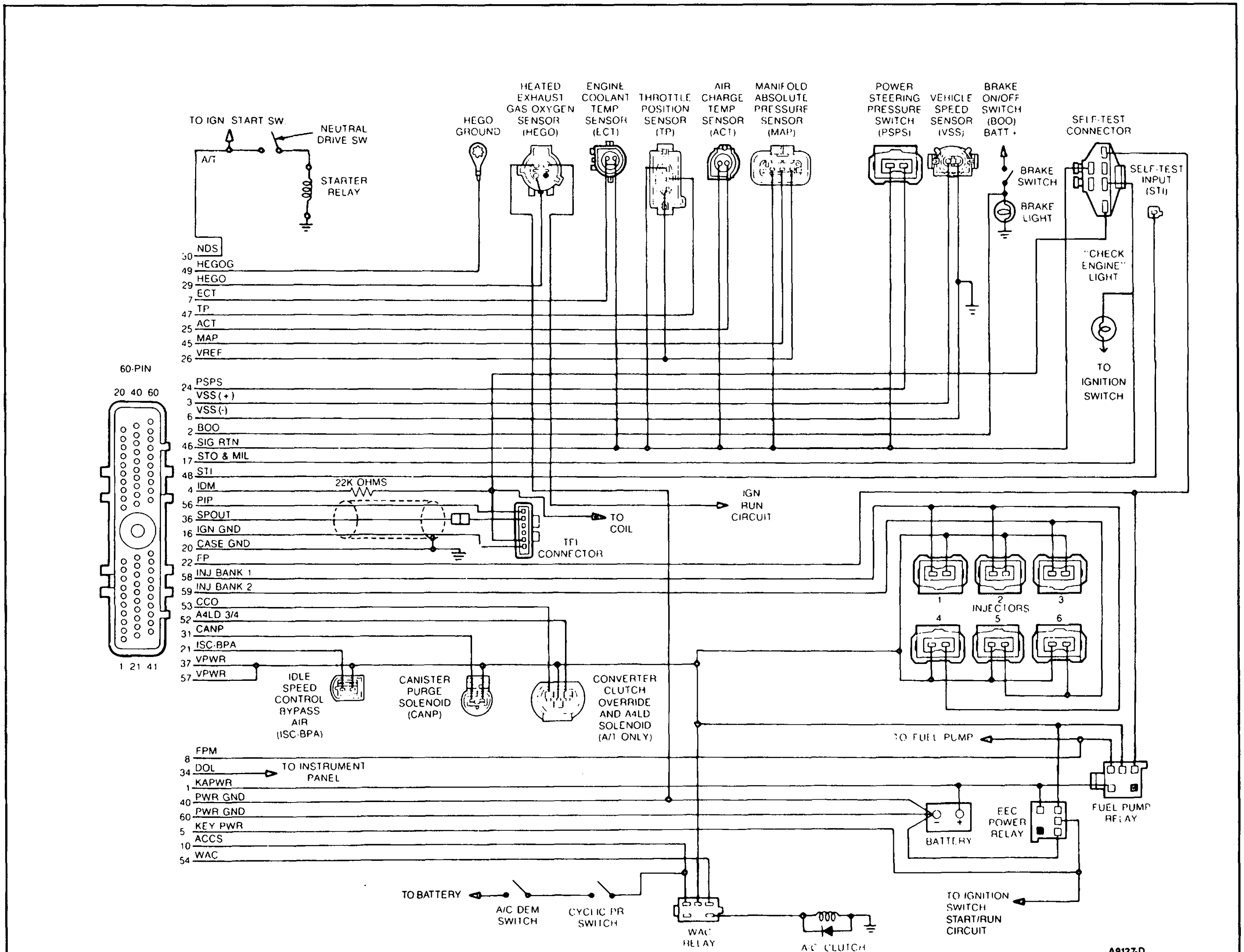
Electrical Schematic

EEC-IV — Engine Supplement — Light Truck

3.0L EFI



NOTE: WIRING SCHEMATIC SHOWS PIN OUT LOOKING INTO HARNESS CONNECTORS

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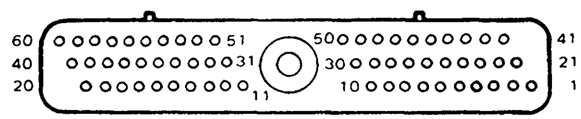
EEC-IV Module Connector Pin Usage

3.0L EFI

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
2	810	R/LG	Brake ON-OFF	BOO
3	150	DG/W	Vehicle Speed Sensor +	VSS+
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
6	398	BK/Y	Vehicle Speed Sensor –	VSS –
7	354	LG/Y	Engine Coolant Temperature Sensor	ECT
8	238A	O/LB	Fuel Pump Monitor	FPM
10	347	BK/Y	A/C Cycle Pressure Switch	ACCS
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output and "Check Engine" Light	STO and MIL
20	57	BK	Case Ground	CASE GND
21	68	O/BK	Idle Speed Control (Bypass Air)	ISC-BPA
22	97	T/LG	Fuel Pump	FP
24	330	Y/LG	Power Steering Pressure Switch	PSPS
25	357	LG/P	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	200	W/BK	Neutral Gear Switch and Clutch Engage Switch (M/T Only)	NGS and CES
30	151	LB/BK	Neutral Drive Switch (A/T Only)	NDS
31	101	GY/Y	Canister Purge	CANP
34	305	LB/PK	Data Output Link	DOL
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
40	60	BK/LG	Power Ground	PWR GND
45	356	DB/LG	Manifold Absolute Pressure Sensor	MAP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Sensor Ground	HEGOG
52	224	T/LB	Automatic 4 Speed Lock Drive (3-4 Shift)	A4LD3/4
53	332	W	Converter Clutch Override (A/T Only)	CCO
54	331	R	W.O.T. A/C Cut-Off	WAC
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	96	T/O	Injector (Bank 1 — Controls Engine Cylinder Numbers 1, 2 and 4)	INJ Bank 1
59	95	T/R	Injector (Bank 2 — Controls Engine Cylinder Numbers 3, 5 and 6)	INJ Bank 2
60	60	BL/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definition

3.0L EFI

SERVICE CODE		SERVICE CODE DEFINITION
11	orc ▶	System PASS
12	r ▶	Unable to control rpm to Self-Test upper limit band
13	r ▶	Unable to control rpm to Self-Test lower limit band
14	c ▶	PIP circuit failure
15	o ▶	ROM test failure
15	c ▶	Power interruption to Keep Alive Memory (KAM)
18	r ▶	SPOUT circuit open
18	c ▶	Loss of tach input to Processor/SPOUT circuit grounded
19	o ▶	Failure of EEC power supply
21	or ▶	ECT sensor input is out of Self-Test range
22	orc ▶	MAP sensor input is out of Self-Test range
23	or ▶	TP sensor input is out of Self-Test range
24	or ▶	ACT sensor input is out of Self-Test range
29	c ▶	Insufficient input from the Vehicle Speed Sensor (VSS)
41	r ▶	HEGO sensor circuit indicates system lean
41	c ▶	No HEGO switching detected
42	r ▶	HEGO sensor circuit indicates system rich
51	oc ▶	ECT sensor input is greater than Self-Test maximum
52	o ▶	PSPS circuit is open
52	r ▶	PSPS always staying open or closed
53	oc ▶	TP sensor input is greater than Self-Test maximum
54	oc ▶	ACT sensor input is greater than Self-Test maximum
61	oc ▶	ECT sensor input is less than Self-Test minimum
63	oc ▶	TP sensor input is less than Self-Test minimum
64	oc ▶	ACT sensor input is less than Self-Test minimum
67	o ▶	Neutral Drive Switch (NDS) circuit open; A/C input high
72	r ▶	Insufficient MAP output change during Dynamic Response Test
73	r ▶	Insufficient TP output change during Dynamic Response Test
74	r ▶	Brake On/Off (BOO) circuit open — not actuated during test
77	r ▶	Brief WOT not sensed during Self-Test/Operator error
85	o ▶	Canister Purge (CANP) circuit failure
86	o ▶	3-4 Shift Solenoid circuit failure
87	oc ▶	Fuel pump primary circuit failure
89	o ▶	Clutch Converter Override (CCO) circuit failure
95	oc ▶	Fuel pump secondary circuit failure
96	oc ▶	Fuel pump secondary circuit failure
98	r ▶	Hard fault is present
NO CODES	▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED	▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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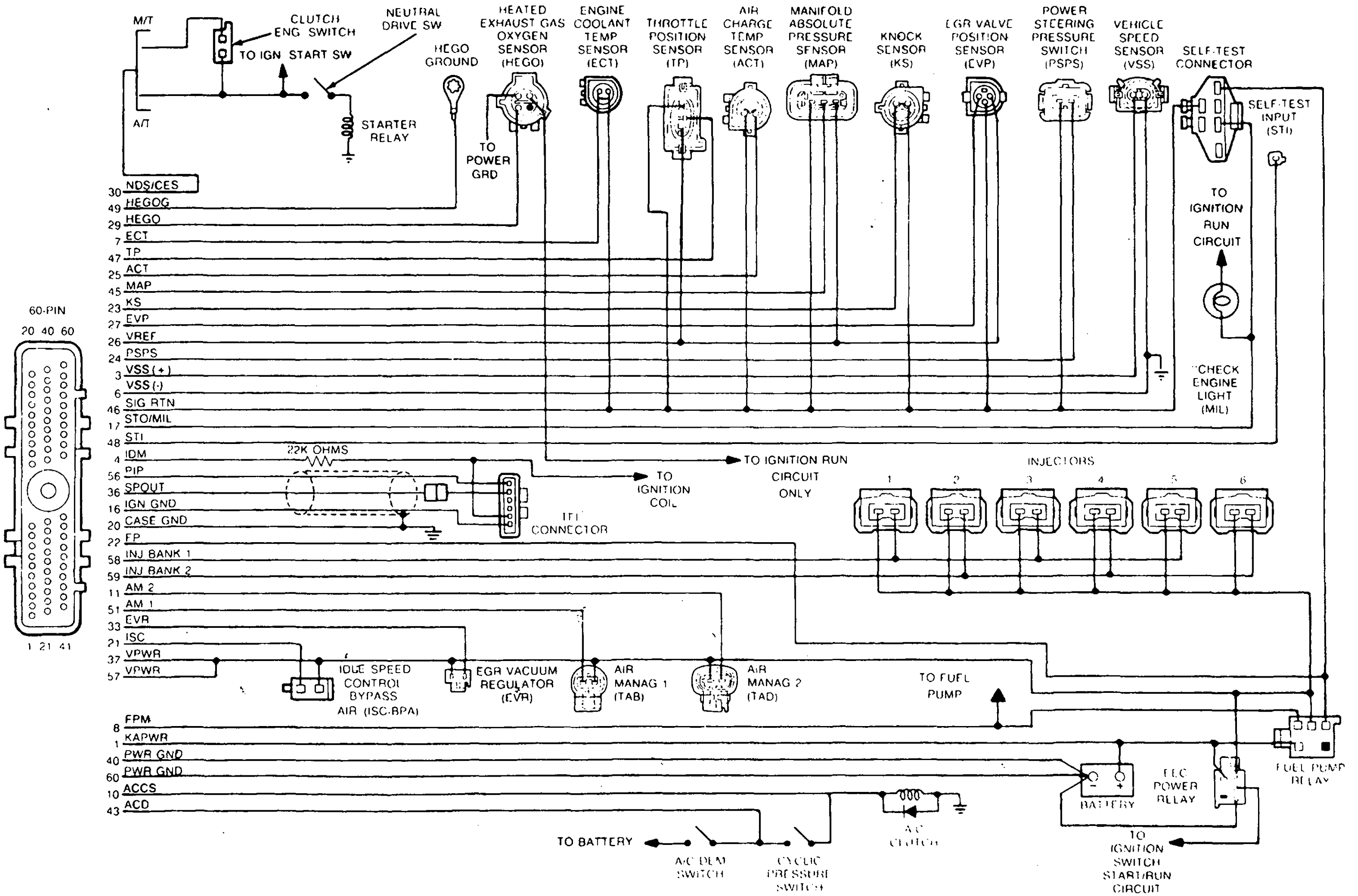
Electrical Schematic

4.9L EFI



NOTE WIRING SCHEMATIC SHOWS PIN OUT LOOKING INTO HARNESS CONNECTOR

A8480-C

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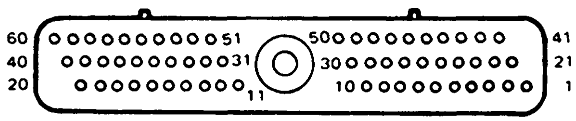
EEC-IV Module Connector Pin Usage

4.9L EFI

F-SERIES/BRONCO

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
3	150	DG/W	Vehicle Speed Sensor +	VSS+
4	11	DG/Y	Ignition Diagnostic Module	IDM
6	57	BK	Vehicle Speed Sensor –	VSS –
7	354	LG/Y	Engine Coolant Temperature Sensor	ECT
8	276	BR	Fuel Pump Monitor	FPM
10	347	BK/Y	A/C Clutch	ACC
11	200	W/BK	Air Management 2	AM 2
16	259	BK/O	Ignition Ground	IGN GND
17	658	PK/LG	Self-Test Output and "Check Engine" Light	STO and MIL
20	57	BK	Case Ground	CASE GND
21	67	GY/W	Idle Speed Control (Bypass Air)	ISC-BPA
22	97	T/LG	Fuel Pump	FS
23	99	LG/BK	Knock Sensor	KS
24	330	Y/LG	Power Steering Pressure Switch	PSPS
25	310	Y/R	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position Sensor	EVP
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	481	GY/Y	Neutral Drive Switch (A/T)/Clutch Engage Switch (M/T)	NDS/CES
33	360	DG	EGR Vacuum Regulator (Solenoid)	EVR
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
40	60	BK/LG	Power Ground	PWR GND
43	348	LG/P	A/C Demand	ACD
45	356	DB/LG	Manifold Absolute Pressure	MAP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Ground	HEGOG
51	190	W/R	Air Management 1	AM 1
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	96	T/O	Injector (Bank 1 — Controls Engine Cylinder Numbers 1, 3 and 5)	INJ Bank 1
59	95	T/R	Injector (Bank 2 — Controls Engine Cylinder Numbers 2, 4 and 6)	INJ Bank 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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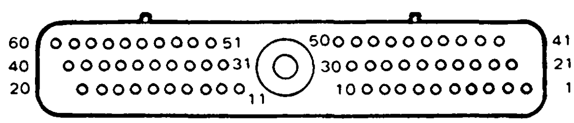
EEC-IV Module Connector Pin Usage

4.9L EFI

E-SERIES

Pin	Circuit	Wire Color	Application	Abbreviations
1	38	BK/O	Keep Alive Power	KAPWR
3	150	DG/W	Vehicle Speed Sensor +	VSS DIF +
4	11	DG/Y	Ignition Diagnostic Module	IDM
6	563	O/Y	Vehicle Speed Sensor –	VSS DIF –
7	354	LG/Y	Engine Coolant Temperature Sensor	ECT
8	238	O/LB	Fuel Pump Monitor	FPM
10	347	BK/Y	A/C Clutch	ACC
11	200	W/BK	Air Management 2	AM2
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output and "Check Engine" Light	STO and MIL
20	57	BK	Case Ground	CASE GND
21	67	GY/W	Idle Speed Control (Bypass Air)	ISC — BPA
22	97	T/LG	Fuel Pump	FP
23	99	LG/BK	Knock Sensor	KS
24	330	Y/LG	Power Steering Pressure Switch	PSPS
25	310	Y/R	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position Sensor	EVP
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	912	LB/W	Neutral Drive Switch (A/T Only)	NDS
30	199	LB/Y	Clutch Interlock/Engage Switch (M/T Only)	CES
33	360	DG	EGR Vacuum Regulator (Solenoid)	EVR
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
40	60	BK/LG	Power Ground	PWR GND
43	348	LG/P	A/C Demand	ACD
45	356	DB/LG	Manifold Absolute Pressure	MAP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Ground	HEGOG
51	190	W/R	Air Management 1	AM1
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	96	T/O	Injector (Bank 1 — Controls Engine Cylinder Numbers 1, 3 and 5)	INJ Bank 1
59	95	T/R	Injector (Bank 2 — Controls Engine Cylinder Numbers 2, 4 and 6)	INJ Bank 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definition

4.9L EFI

SERVICE CODE		SERVICE CODE DEFINITION
11 orc	▶	System PASS
12 r	▶	Unable to control rpm to Self-Test upper limit band
13 r	▶	Unable to control rpm to Self-Test lower limit band
14 c	▶	PIP circuit failure
15 o	▶	ROM test failure
15 c	▶	Power interruption to Keep Alive Memory (KAM)
18 r	▶	SPOUT circuit open
18 c	▶	Loss of tach input to Processor/SPOUT circuit grounded
19 o	▶	Failure of EEC power supply
21 or	▶	ECT sensor input is out of Self-Test range
22 orc	▶	MAP sensor input is out of Self-Test range
23 or	▶	TP sensor input is out of Self-Test range
24 or	▶	ACT sensor input is out of Self-Test range
25 r	▶	KS sensor signal is not sensed in Dynamic Response Test
29 c	▶	Insufficient input from the Vehicle Speed Sensor (VSS)
31 orc	▶	EVP circuit is below minimum voltage
32 orc	▶	EVP voltage is below closed limit (SONIC)
33 rc	▶	EGR valve is not opening (SONIC)
34 orc	▶	EVP voltage is above closed limit (SONIC)
35 orc	▶	EVP circuit is above maximum voltage
41 r	▶	HEGO sensor circuit indicates system lean
41 c	▶	No HEGO switching detected
42 r	▶	HEGO sensor circuit indicates system rich
44 r	▶	Thermactor air system inoperative
45 r	▶	Thermactor air upstream during Self-Test
46 r	▶	Thermactor air not bypassed during Self-Test
51 oc	▶	ECT sensor input is greater than Self-Test maximum
52 o	▶	PSPS circuit is open
52 r	▶	PSPS always staying open or closed
53 oc	▶	TP sensor input is greater than Self-Test maximum
54 oc	▶	ACT sensor input is greater than Self-Test maximum
61 oc	▶	ECT sensor input is less than Self-Test minimum
63 oc	▶	TP sensor input is less than Self-Test minimum
64 oc	▶	ACT sensor input is less than Self-Test minimum
67 o	▶	Neutral Drive Switch (NDS) circuit open; A/C input high
72 r	▶	Insufficient MAP output change during Dynamic Response Test
73 r	▶	Insufficient TP output change during Dynamic Response Test
77 r	▶	Brief WOT not sensed during Self-Test/Operator error
81 o	▶	Air Management 2 (AM2) circuit failure
82 o	▶	Air Management 1 (AM1) circuit failure
84 o	▶	EGR Vacuum Regulator (EVR) circuit failure
87 oc	▶	Fuel pump primary circuit failure
95 oc	▶	Fuel pump secondary circuit failure
96 oc	▶	Fuel pump secondary circuit failure
98 r	▶	Hard fault is present
NO CODES	▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED	▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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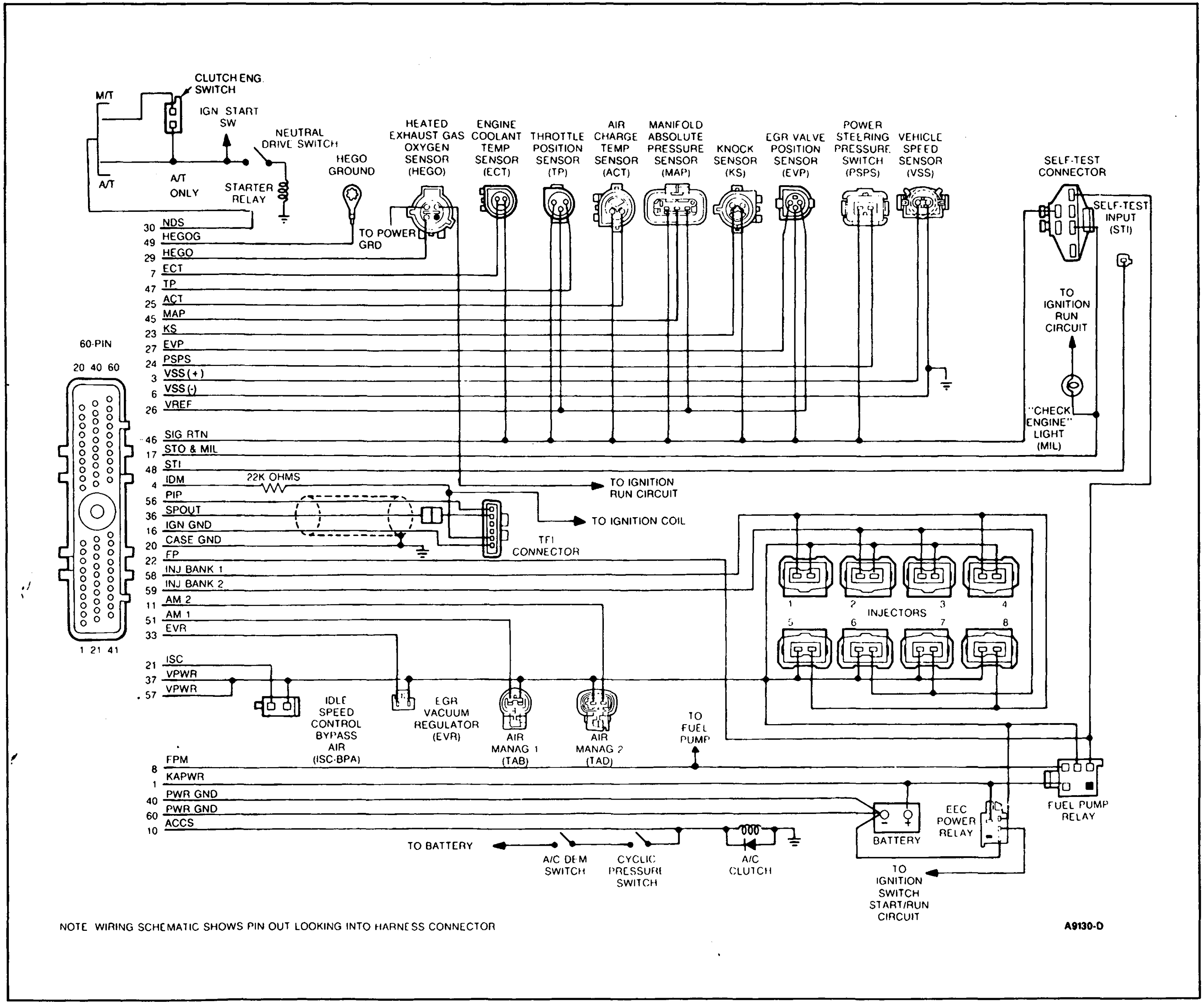
Electrical Schematic



5.0L EFI

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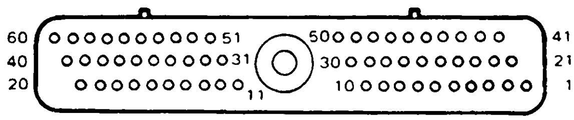
EEC-IV Module Connector Pin Usage

5.0L EFI

F-SERIES/BRONCO

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
3	150	DG/W	Vehicle Speed Sensor +	VSS+
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
6	57	BK	Vehicle Speed Sensor –	VSS –
7	354	LG/Y	Engine Coolant Temperature Sensor	ECT
8	276	BR	Fuel Pump Monitor	FPM
10	347	BK/Y	A/C Cycling Switch	ACCS
11	200	W/BK	Air Management 2	AM-2
16	259	BK/O	Ignition Ground	IGN GND
17	658	PK/LG	Self-Test Output and "Check Engine" Light	STO and MIL
20	57	BK	Case Ground	CASE GND
21	67	GY/W	Idle Speed Control (Bypass Air)	ISC — BPA
22	97	T/LG	Fuel Pump	FP
23	99	LG/BK	Knock Sensor	KS
24	330	Y/LG	Power Steering Pressure Switch	PSPS
25	310	Y/R	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position Sensor	EVP
29	94	DG/P	Heated Exhaust Oxygen Sensor	HEGO
30	481	GY/Y	Neutral Drive Switch	NDS
33	360	DG	EGR Vacuum Regulator (Solenoid)	EVR
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
40	60	BK/LG	Power Ground	PWR GND
45	356	DB/LG	Manifold Absolute Pressure	MAP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Oxygen Ground	HEGOG
51	190	W/R	Air Management 1	AM-1
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	96	T/O	Injector (Bank 1 — Controls Engine Cylinder Numbers 1, 4, 5 and 8)	INJ Bank 1
59	95	T/R	Injector (Bank 2 — Controls Engine Cylinder Numbers 2, 3, 6 and 7)	INJ Bank 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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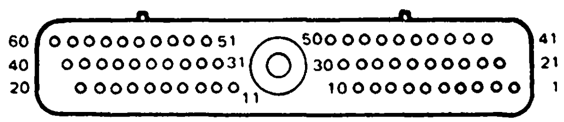
EEC-IV Module Connector Pin Usage

5.0L EFI

E-SERIES

Pin	Circuit	Wire Color	Application	Abbreviations
1	38	BK/O	Keep Alive Power	KAPWR
3	150	DG/W	Vehicle Speed Sensor +	VSS+
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
6	563	O/Y	Vehicle Speed Sensor –	VSS–
7	354	LG/Y	Engine Coolant Temperature Sensor	ECT
8	238	O/LB	Fuel Pump Monitor	FPM
10	347	BK/Y	A/C Cycling Switch	ACCS
11	200	W/BK	Air Management 2	AM 2
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output and "Check Engine" Light	STO and MIL
20	57	BK	Case Ground	CASE GND
21	67	GY/W	Idle Speed Control (Bypass Air)	ISC-BPA
22	97	T/LG	Fuel Pump	FP
23	99	LG/BK	Knock Sensor	KS
24	330	Y/LG	Power Steering Pressure Switch	PSPS
25	310	Y/R	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position Sensor	EVP
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	912	LB/W	Neutral Drive Switch	NDS
33	360	DG	EGR Vacuum Regulator (Solenoid)	EVR
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
40	60	BK/LG	Power Ground	PWR GND
45	356	DB/LG	Manifold Absolute Pressure	MAP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Ground	HEGOG
51	190	W/R	Air Management 1	AM 1
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	96	T/O	Injector (Bank 1 — Controls Engine Cyl. Numbers 1, 4, 5 and 8)	INJ Bank 1
59	95	T/R	Injector (Bank 2 — Controls Engine Cyl. Numbers 2, 3, 6 and 7)	INJ Bank 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definition

5.0L EFI

SERVICE CODE		SERVICE CODE DEFINITION
11	orc	System PASS
12	r	Unable to control rpm to Self-Test upper limit band
13	r	Unable to control rpm to Self-Test lower limit band
14	c	PIP circuit failure
15	o	ROM test failure
15	c	Power interruption to Keep Alive Memory (KAM)
18	r	SPOUT circuit open
18	c	Loss of tach input to Processor/SPOUT circuit grounded
19	o	Failure of EEC power supply
21	or	ECT sensor input is out of Self-Test range
22	orc	MAP sensor input is out of Self-Test range
23	or	TP sensor input is out of Self-Test range
24	or	ACT sensor input is out of Self-Test range
25	r	KS sensor signal is not sensed in Dynamic Response Test
29	c	Insufficient input from the Vehicle Speed Sensor (VSS)
31	orc	EVP circuit is below minimum voltage
32	orc	EVP voltage is below closed limit (SONIC)
33	rc	EGR valve is not opening (SONIC)
34	orc	EVP voltage is above closed limit (SONIC)
35	orc	EVP circuit is above maximum voltage
41	r	HEGO sensor circuit indicates system lean
41	c	No HEGO switching detected
42	r	HEGO sensor circuit indicates system rich
44	r	Thermactor air system inoperative
45	r	Thermactor air upstream during Self-Test
46	r	Thermactor air not bypassed during Self-Test
51	oc	ECT sensor input is greater than Self-Test maximum
52	o	PSPS circuit is open
52	r	PSPS always staying open or closed
53	oc	TP sensor input is greater than Self-Test maximum
54	oc	ACT sensor input is greater than Self-Test maximum
61	oc	ECT sensor input is less than Self-Test minimum
63	oc	TP sensor input is less than Self-Test minimum
64	oc	ACT sensor input is less than Self-Test minimum
67	o	Neutral Drive Switch (NDS) circuit open; A/C input high
72	r	Insufficient MAP output change during Dynamic Response Test
73	r	Insufficient TP output change during Dynamic Response Test
77	r	Brief WOT not sensed during Self-Test/Operator error
81	o	Air Management 2 (AM2) circuit failure
82	o	Air Management 1 (AM1) circuit failure
84	o	EGR Vacuum Regulator (EVR) circuit failure
87	oc	Fuel pump primary circuit failure
95	oc	Fuel pump secondary circuit failure
96	oc	Fuel pump secondary circuit failure
98	r	Hard fault is present
NO CODES		Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED		Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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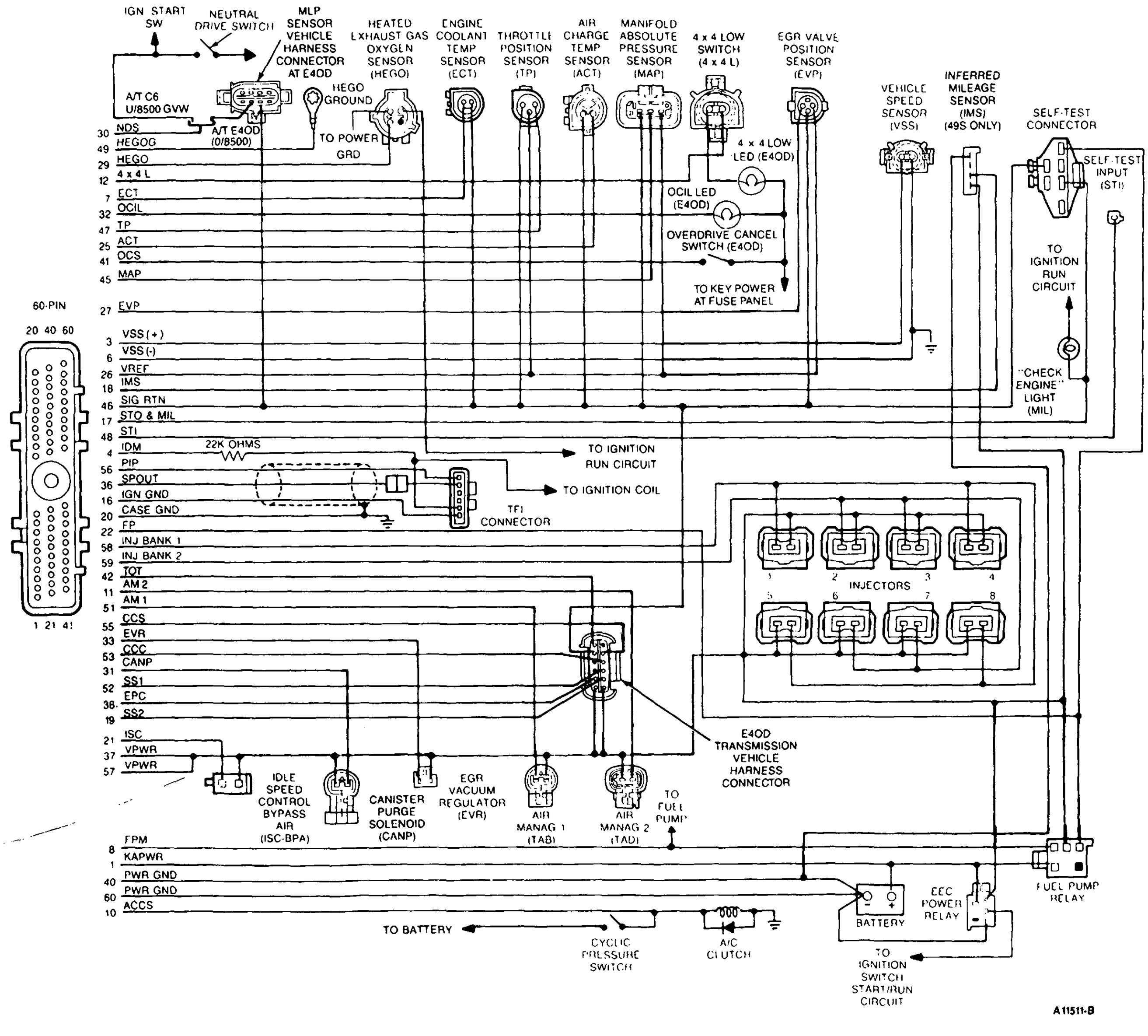
Electrical Schematic

5.8L EFI



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EEC-IV Module Connector Pin Usage

5.8L EFI

F-SERIES/BRONCO

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
2	511	LG	Brake On/Off (E4OD only)	BOO
3	150	DG/W	Vehicle Speed Sensor +	VSS+
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
6	57	BK	Vehicle Speed Sensor –	VSS –
7	354	LG/Y	Engine Coolant Temperature Sensor	ECT
8	276	BR	Fuel Pump Monitor	FPM
10	347	BK/Y	A/C Cycling Switch	ACCS
11	200	W/BK	Air Management 2	AM-2
12	784	LB/BK	4 x 4 Low Switch (E4OD only)	4 x 4L
16	259	BK/O	Ignition Ground	IGN GND
17	658	PK/LG	Self-Test Output and "Check Engine" Light	STO and MIL
18	223	T/LG	Inferred Mileage Sensor (49 States)	IMS
19	315	DB/P	Transmission Shift Solenoid #2 (E4OD only)	SS2
20	57	BK	Case Ground	CASE GND
21	67	GY/W	Idle Speed Control — Bypass Air	ISC — BPA
22	97	T/LG	Fuel Pump	FP
25	310	Y/R	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position Sensor	EVP
29	94	DG/P	Heated Exhaust Oxygen Sensor	HEGO
30	481	GY/Y	Neutral Drive Switch (A/T Only)	NDS
30	912	LB/W	Manual Lever Position Sensor (E4OD only)	MLP
31	101	GY/Y	Canister Purge — Solenoid	CANP
32	911	LG/W	Overdrive Cancel Indicator Light (E4OD only)	OCIL
33	360	DG	EGR Vacuum Regulator (Solenoid)	EVR

(Continued)

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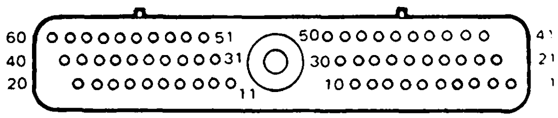
EEC-IV Module Connector Pin Usage

5.8L EFI

F-SERIES/BRONCO

Pin	Circuit	Wire Color	Application	Abbreviations
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Electronic Pressure Control Power/Vehicle Power	EPCPWR/VPWR
38	199	LB/Y	Electronic Pressure Control — Solenoid (E4OD Only)	EPC
40	60	BK/LG	Power Ground	PWR GND
41	224	T/LB	Overdrive Cancel Switch (E4OD only)	OCS
42	923	O/BK	Transmission Oil Temperature (E4OD only)	TOT
45	356	DB/LG	Manifold Absolute Pressure	MAP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Oxygen Ground	HEGOG
51	190	W/R	Air Management 1	AM-1
52	237	O/Y	Transmission Shift Solenoid #1 (E4OD Only)	SS1
53	480	P/Y	Converter Clutch Control Solenoid (E4OD Only)	CCC
55	924	BR	Converter Coast Solenoid (E4OD only)	CCS
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Electronic Pressure Control Power/Vehicle Power	EPCPWR/VPWR
58	96	T/O	Injector Bank 1 (Controls Engine Cylinder Numbers 1, 4, 5 and 8)	INJ Bank 1
59	95	T/R	Injector Bank 2 (Controls Engine Cylinder Numbers 2, 3, 6 and 7)	INJ Bank 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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EEC-IV Module Connector Pin Usage

5.8L EFI

E-SERIES

Pin	Circuit	Wire Color	Application	Abbreviations
1	38	BK/O	Keep Alive Power	KAPWR
2	511	LG	Brake On/Off (E4OD only)	BOO
3	150	DG/W	Vehicle Speed Sensor +	VSS+
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
6	563	O/Y	Vehicle Speed Sensor –	VSS –
7	354	LG/Y	Engine Coolant Temperature Sensor	ECT
8	238	O/LB	Fuel Pump Monitor	FPM
10	347	BK/Y	A/C Cycling Switch	ACCS
11	200	W/BK	Air Management 2	AM 2
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output and "Check Engine" Light	STO and MIL
18	223	T/LG	Inferred Mileage Sensor (49 States)	IMS
19	315	DG/P	Transmission Shift Solenoid #2 (E4OD only)	SS2
20	57	BK	Case Ground	CASE GND
21	67	GY/W	Idle Speed Control — Bypass Air	ISC-BPA
22	97	T/LG	Fuel Pump	FP
25	310	Y/R	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position Sensor	EVP
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	912	BR/W	Neutral Drive Switch	NDS
30	912	LB/W	Manual Lever Position Sensor (E4OD only)	MLP
31	101	GY/Y	Canister Purge Solenoid	CANP
32	911	LG/W	Overdrive Cancel Indicator Light (E4OD only)	OCIL
33	360	DG	EGR Vacuum Regulator (Solenoid)	EVR
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Electronic Pressure Control Power/Vehicle Power	EPCPWR/VPWR
38	199	LB/Y	Electronic Pressure Control-Solenoid (E4OD Only)	EPC
40	60	BK/LG	Power Ground	PWR GND
41	224	T/LB	Overdrive Cancel Switch (E4OD only)	OCS
42	923	O/BK	Transmission Oil Temperature Sensor (E4OD only)	TOT

(Continued)

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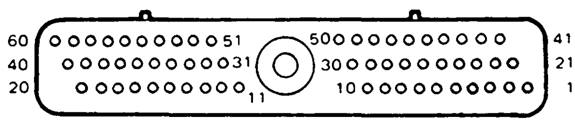
EEC-IV Module Connector Pin Usage

5.8L EFI

E-SERIES

Pin	Circuit	Wire Color	Application	Abbreviations
45	356	DB/LG	Manifold Absolute Pressure	MAP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Ground	HEGOG
51	190	W/R	Air Management 1	AM 1
52	237	O/Y	Transmission Shift Solenoid #1 (E4OD Only)	SS1
53	480	P/Y	Converter Clutch Control Solenoid (E4OD Only)	CCC
55	924	BR	Converter Coast Solenoid (E4OD Only)	CCS
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Electronic Pressure Control Power/Vehicle Power	EPCPWR/VPWR
58	96	T/O	Injector Bank 1 (Controls Engine Cyl. Nos. 1, 4, 5, and 8)	INJ Bank 1
59	95	T/R	Injector Bank 2 (Controls Engine Cyl. Nos. 2, 3, 6, and 7)	INJ Bank 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definition

5.8L EFI

SERVICE CODE		SERVICE CODE DEFINITION
11	orc	System PASS
12	r	Unable to control rpm to Self-Test upper limit band
13	r	Unable to control rpm to Self-Test lower limit band
14	c	PIP circuit failure
15	o	ROM test failure
18	r	SPOUT circuit open
18	c	Loss of tach input to Processor/SPOUT circuit grounded
19	o	Failure of EEC power supply
21	or	ECT sensor input is out of Self-Test range
22	orc	MAP sensor input is out of Self-Test range
23	or	TP sensor input is out of Self-Test range
24	or	ACT sensor input is out of Self-Test range
29	c	Insufficient input from the Vehicle Speed Sensor (VSS)
31	orc	EVP circuit is below minimum voltage
32	orc	EVP voltage is below closed limit (SONIC)
33	rc	EGR valve is not opening (SONIC)
34	orc	EVP voltage is above closed limit (SONIC)
35	orc	EVP circuit is above maximum voltage
41	r	HEGO sensor circuit indicates system lean
41	c	No HEGO switching detected
42	r	HEGO sensor circuit indicates system rich
44	r	Thermactor air system inoperative
45	r	Thermactor air upstream during Self-Test
46	r	Thermactor air not bypassed during Self-Test
51	oc	ECT sensor input is greater than Self-Test maximum
53	oc	TP sensor input is greater than Self-Test maximum
54	oc	ACT sensor input is greater than Self-Test maximum
61	oc	ECT sensor input is less than Self-Test minimum
63	oc	TP sensor input is less than Self-Test minimum
64	oc	ACT sensor input is less than Self-Test minimum
67	o	Neutral Drive Switch (NDS) circuit open; A/C input high
72	r	Insufficient MAP output change during Dynamic Response Test
73	r	Insufficient TP output change during Dynamic Response Test
77	r	Brief WOT not sensed during Self-Test/Operator error
81	o	Air Management 2 (AM2) circuit failure
82	o	Air Management 1 (AM1) circuit failure
84	o	EGR Vacuum Regulator (EVR) circuit failure
87	oc	Fuel pump primary circuit failure
95	oc	Fuel pump secondary circuit failure
96	oc	Fuel pump secondary circuit failure
98	r	Hard fault is present
NO CODES		Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED		Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running c = Continuous Memory

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Quick Test Codes and Code Definition

5.8L E4OD EFI

SERVICE CODE		SERVICE CODE DEFINITION
11 orc	▶	System PASS
12 r	▶	Unable to control rpm to Self-Test upper limit band
13 r	▶	Unable to control rpm to Self-Test lower limit band
14 c	▶	PIP circuit failure
15 o	▶	ROM test failure
15 c	▶	Power interruption to Keep Alive Memory (KAM)
18 r	▶	SPOUT circuit open
18 c	▶	Loss of tach input to Processor/SPOUT circuit grounded
19 o	▶	Failure of EEC power supply
21 or	▶	ECT sensor input is out of Self-Test range
22 orc	▶	MAP sensor input is out of Self-Test range
23 or	▶	TP sensor input is out of Self-Test range
24 or	▶	ACT sensor input is out of Self-Test range
26 or	▶	TOT sensor input is out of Self-Test range
29 c	▶	Insufficient input from the Vehicle Speed Sensor (VSS)
31 orc	▶	EVP circuit is below minimum voltage
32 orc	▶	EVP voltage is below closed limit (SONIC)
33 rc	▶	EGR valve is not opening (SONIC)
34 orc	▶	EVP voltage is above closed limit (SONIC)
35 orc	▶	EVP circuit is above maximum voltage
41 r	▶	HEGO sensor circuit indicates system lean
41 c	▶	No HEGO switching detected
42 r	▶	HEGO sensor circuit indicates system rich
44 r	▶	Thermactor air system inoperative
45 r	▶	Thermactor air upstream during Self-Test
46 r	▶	Thermactor air not bypassed during Self-Test
47 o	▶	4 x 4 switch is closed
49 c	▶	1-2 shift error
51 oc	▶	ECT sensor input is greater than Self-Test maximum
53 oc	▶	TP sensor input is greater than Self-Test maximum
54 oc	▶	ACT sensor input is greater than Self-Test maximum
56 oc	▶	TOT sensor input is greater than Self-Test maximum
59 c	▶	2-3 shift error
61 oc	▶	ECT sensor input is less than Self-Test minimum
62 c	▶	Converter clutch failure
63 oc	▶	TP sensor input is less than Self-Test minimum
64 oc	▶	ACT sensor input is less than Self-Test minimum
65 r	▶	Overdrive Cancel Switch (OCS) not changing state
66 oc	▶	TOT sensor input is less than Self-Test minimum

(Continued)

KEY: o = Key On Engine Off (KOEO)   r = Engine Running (ER)   c = Continuous Memory

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Quick Test Codes and Code Definition

5.8L E4OD EFI

SERVICE CODE		SERVICE CODE DEFINITION
67 oc	▶	MLP sensor out of range; A/C input high
69 c	▶	3-4 shift error
72 r	▶	Insufficient MAP output change during Dynamic Response Test
73 r	▶	Insufficient TP output change during Dynamic Response Test
74 r	▶	Brake On/Off (BOO) circuit open — not actuated during test
77 r	▶	Brief WOT sensed during Self-Test/Operator error
81 o	▶	Air Management 2 (AM2) circuit failure
82 o	▶	Air Management 1 (AM1) circuit failure
84 o	▶	EGR Vacuum Regulator (EVR) circuit failure
85 o	▶	Canister Purge (CANP) circuit failure
87 oc	▶	Fuel pump primary circuit failure
91 o	▶	Shift Solenoid 1 (SS1) circuit failure
92 o	▶	Shift Solenoid 2 (SS2) circuit failure
93 o	▶	Coast Clutch Solenoid (CCS) circuit failure
94 o	▶	Converter Clutch Control (CCC) solenoid circuit failure
95 oc	▶	Fuel pump secondary circuit failure
96 oc	▶	Fuel pump secondary circuit failure
97 o	▶	Overdrive Cancel Indicator Light (OCIL) circuit failure
98 o	▶	Electronic Pressure Control (EPC) driver failure in Processor
98 r	▶	Hard fault is present
99 oc	▶	Electronic Pressure Control (EPC) circuit failure
NO CODES	▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED	▶	Services codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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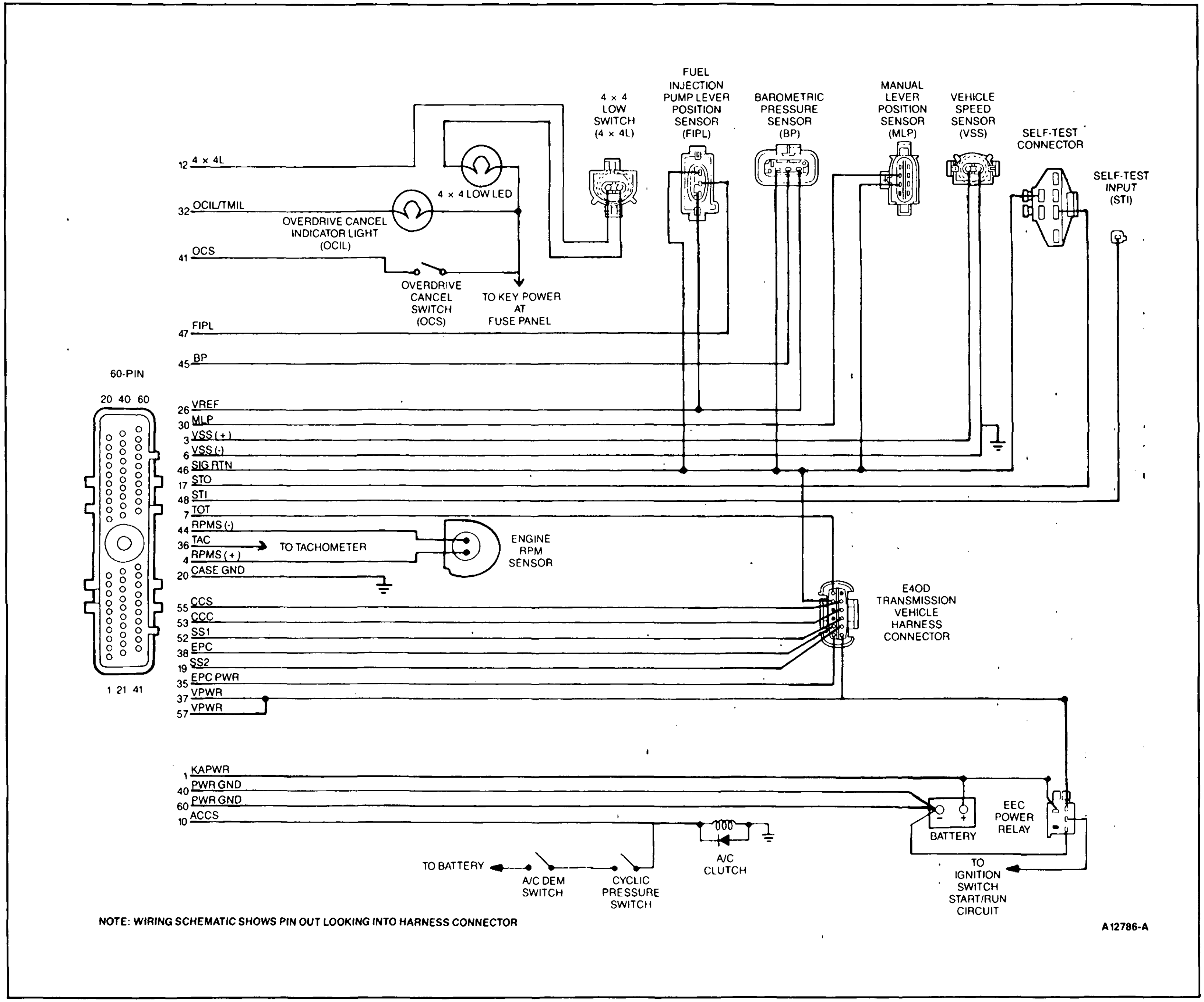
Electrical Schematic

7.3L E4OD Diesel



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Quick Test Codes and Code Definition

7.3L E4OD DIESEL

SERVICE CODE			SERVICE CODE DEFINITION
11	orc	▷	System PASS
14	c	▷	Engine RPM sensor circuit fault
15	o	▷	ROM test failure
15	c	▷	Power interruption to Keep Alive Memory (KAM)
19	o	▷	Failure of EEC power supply
22	orc	▷	BP sensor input is out of Self-Test range
23	or	▷	FIPL sensor input is out of Self-Test range
26	c	▷	TOT sensor input is out of Self-Test range
29	c	▷	Insufficient input from the Vehicle Speed Sensor (VSS)
47	o	▷	4 x 4 switch is closed
49	c	▷	1-2 shift error
53	oc	▷	FIPL sensor input is greater than Self-Test maximum
56	oc	▷	TOT sensor input is greater than Self-Test maximum
59	c	▷	2-3 shift error
62	c	▷	Converter clutch failure
63	oc	▷	FIPL sensor input is less than Self-Test minimum
65	r	▷	Overdrive Cancel Switch (OCS) not changing state
66	oc	▷	TOT sensor input is less than Self-Test minimum
67	oc	▷	MLP sensor out of range; A/C input high
69	c	▷	3-4 shift error
74	r	▷	Brake On/Off (BOO) circuit open — not actuated during test
91	o	▷	Shift Solenoid 1 (SS1) circuit failure
92	o	▷	Shift Solenoid 2 (SS2) circuit failure
93	o	▷	Coast Clutch Solenoid (CCS) circuit failure
94	o	▷	Converter Clutch Control (CCC) solenoid circuit failure
97	o	▷	Overdrive Cancel Indicator Light (OCIL) circuit failure
98	o	▷	Electronic Pressure Control (EPC) driver failure in processor
99	oc	▷	Electronic Pressure Control (EPC) circuit failure
NO CODES		▷	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED		▷	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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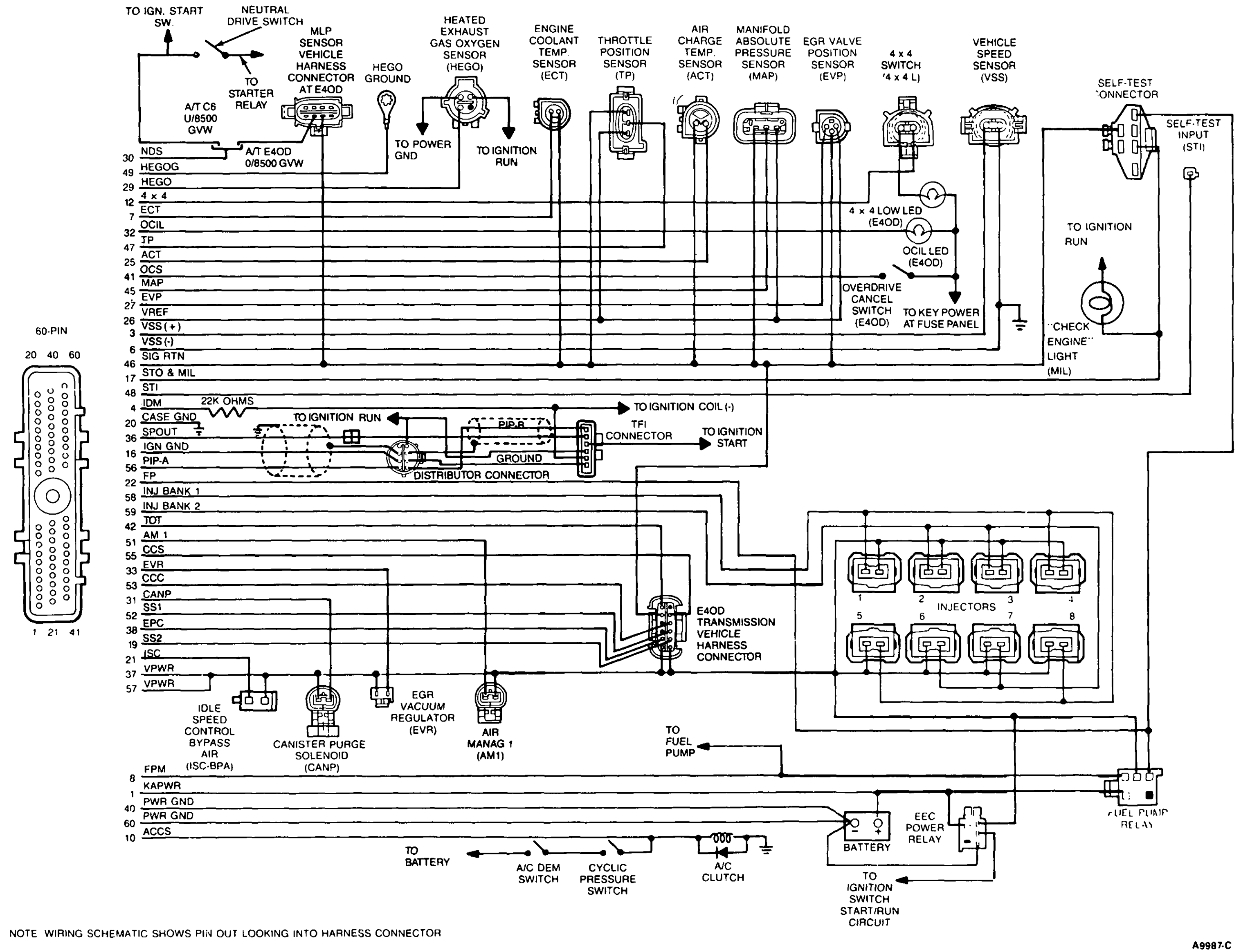
Electrical Schematic



NOTE WIRING SCHEMATIC SHOWS PIN OUT LOOKING INTO HARNESS CONNECTOR

7.5L EFI

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EEC-IV Module Connector Pin Usage

7.5L EFI

F-SERIES

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
2	511	LG	Brake On/Off (E4OD only)	BOO
3	150	DG/W	Vehicle Speed Sensor + (E4OD only)	VSS +
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
6	57	BK	Vehicle Speed Sensor - (E4OD only)	VSS -
7	354	LG/Y	Engine Coolant Temperature Sensor	ECT
8	276	BR	Fuel Pump Monitor	FPM
10	347	BK/Y	A/C Cycling Switch	ACCS
12	784	LB/BK	4 x 4 Low Switch (E4OD only)	4 x 4L
16	259	BK/O	Ignition Ground	IGN GND
17	658	PK/LG	Self-Test Output and "Check Engine" Light	STO and MIL
19	315	DB/P	Transmission Shift Solenoid #2 (E4OD only)	SS2
20	57	BK	Case Ground	CASE GND
21	67	GY/W	Idle Speed Control (Bypass Air)	ISC — BPA
22	97	T/LG	Fuel Pump	FP
25	310	Y/R	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position Sensor	EVP
29	94	DG/P	Heated Exhaust Oxygen Sensor	HEGO
30	481	GY/Y	Neutral Drive Switch	NDS
30	912	LB/W	Manual Lever Position Sensor (E4OD only)	MLP
31	101	GY/Y	Canister Purge	CANP
32	911	LG/W	Overdrive Cancel Indicator Light (E4OD only)	OCIL
33	360	DG	EGR Vacuum Regulator (Solenoid)	EVR
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Electronic Pressure Control Power/Vehicle Power	EPCPWR/VPWR
38	199	LB/Y	Electronic Pressure Control Solenoid (E4OD)	EPC

(Continued)

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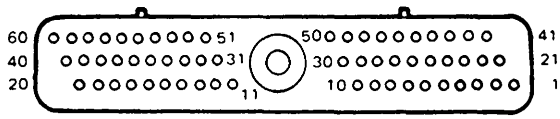
EEC-IV Module Connector Pin Usage

7.5L EFI

F-SERIES

Pin	Circuit	Wire Color	Application	Abbreviations
40	60	BK/LG	Power Ground	PWR GND
41	224	T/LB	Overdrive Cancel Switch (E4OD only)	OCS
42	923	O/BK	Transmission Oil Temperature Sensor (E4OD only)	TOT
45	356	DB/LG	Manifold Absolute Pressure	MAP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Oxygen Ground	HEGOG
51	190	W/R	Air Management 1	AM 1
52	237	O/Y	Transmission Shift Solenoid #1 (E4OD Only)	SS1
53	480	P/Y	Converter Clutch Control Solenoid (E4OD Only)	CCC
55	924	BR	Converter Coast Solenoid (E4OD Only)	CCS
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Electronic Pressure Control Power/Vehicle Power	EPCPWR/VPWR
58	96	T/O	Injector (Bank 1 Controls Engine Cylinder Numbers 1, 4, 5 and 8)	INJ Bank 1
59	95	T/R	Injector (Bank 2 Controls Engine Cylinder Numbers 2, 3, 6 and 7)	INJ Bank 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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EEC-IV Module Connector Pin Usage

7.5L EFI

E-SERIES (E4OD only)

Pin	Circuit	Wire Color	Application	Abbreviations
1	38	BK/O	Keep Alive Power	KAPWR
2	511	LG	Brake On/Off	BOO
3	150	DG/W	Vehicle Speed Sensor +	VSS +
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
6	563	O/Y	Vehicle Speed Sensor –	VSS –
7	354	LG/Y	Engine Coolant Temperature	ECT
8	238	O/LB	Fuel Pump Monitor	FPM
10	347	BK/Y	A/C Cycling Switch	ACCS
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output and "Check Engine" Light	STO/MIL
19	315	DG/P	Transmission Shift Solenoid #2	SS2
20	57	BK	Case Ground	CASE GND
21	67	GY/W	Idle Speed Control Bypass Air	ISC-BPA
22	97	T/LG	Fuel Pump	FP
25	310	Y/R	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position Sensor	EVP
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	912	LB/W	Manual Lever Position Sensor	MLP
31	101	GY/Y	Canister Purge	CANP
32	911	LG/W	Overdrive Cancel Indicator Light	OCIL
33	360	DG	EGR Vacuum Regulator (Solenoid)	EVR
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
38	199	LB/Y	Electronic Pressure Control (Solenoid)	EPC
40	60	BK/LG	Power Ground	PWR GND
41	224	T/LB	Overdrive Cancel Switch	OCS
42	923	O/BK	Transmission Oil Temperature Sensor	TOT
45	356	DB/LG	Manifold Absolute Pressure	MAP

(Continued)

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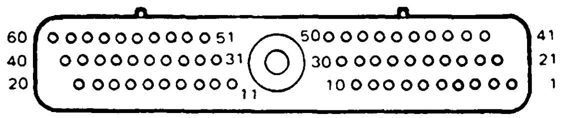
EEC-IV Module Connector Pin Usage

7.5L EFI

E-SERIES (E4OD only)

Pin	Circuit	Wire Color	Application	Abbreviations
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Ground	HEGOG
51	190	W/R	Air Management 1	AM1
52	237	O/Y	Transmission Shift Solenoid #1	SS1
53	480	P/Y	Converter Clutch Control Solenoid	CCC
55	924	BR	Converter Coast Solenoid	CCS
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	96	T/O	Injector (Bank 1 Controls Engine Cylinder Numbers 1, 4, 5 and 8)	INJ Bank 1
59	95	T/R	Injector (Bank 2 Controls Engine Cylinder Numbers 2, 3, 6 and 7)	INJ Bank 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definition

7.5L EFI

SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Unable to control rpm to Self-Test upper limit band
13 r ▶	Unable to control rpm to Self-Test lower limit band
14 c ▶	PIP circuit failure
15 o ▶	ROM test failure
15 c ▶	Power interruption to Keep Alive Memory (KAM)
18 r ▶	SPOUT circuit open
18 c ▶	Loss of tach input to Processor/SPOUT circuit grounded
19 o ▶	Failure of EEC power supply
21 or ▶	ECT sensor input is out of Self-Test range
22 orc ▶	MAP sensor input is out of Self-Test range
23 or ▶	TP sensor input is out of Self-Test range
24 or ▶	ACT sensor input is out of Self-Test range
31 orc ▶	EVP circuit is below minimum voltage
32 orc ▶	EVP voltage is below closed limit (SONIC)
33 rc ▶	EGR valve is not opening (SONIC)
34 orc ▶	EVP voltage is above closed limit (SONIC)
35 orc ▶	EVP circuit is above maximum voltage
41 r ▶	HEGO sensor circuit indicates system lean
41 c ▶	No HEGO switching detected
42 r ▶	HEGO sensor circuit indicates system rich
44 r ▶	Thermactor air system inoperative
51 oc ▶	ECT sensor input is greater than Self-Test maximum
53 oc ▶	TP sensor input is greater than Self-Test maximum
54 oc ▶	ACT sensor input is greater than Self-Test maximum
61 oc ▶	ECT sensor input is less than Self-Test minimum
63 oc ▶	TP sensor input is less than Self-Test minimum
64 oc ▶	ACT sensor input is less than Self-Test minimum
67 o ▶	Neutral Drive Switch (NDS) circuit open: A/C input high
72 r ▶	Insufficient MAP output change during Dynamic Response Test
73 r ▶	Insufficient TP output change during Dynamic Response Test
77 r ▶	Brief WOT not sensed during Self-Test/Operator error
82 o ▶	Air Management 1 (AM1) circuit failure
84 o ▶	EGR Vacuum Regulator (EVR) circuit failure
87 oc ▶	Fuel pump primary circuit failure
95 oc ▶	Fuel pump secondary circuit failure
96 oc ▶	Fuel pump secondary circuit failure
98 r ▶	Hard fault is present
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Quick Test Codes and Code Definition

7.5L E4OD EFI

SERVICE CODE		SERVICE CODE DEFINITION
11	orc ▶	System PASS
12	r ▶	Unable to control rpm to Self-Test upper limit band
13	r ▶	Unable to control rpm to Self-Test lower limit band
14	c ▶	PIP circuit failure
15	o ▶	ROM test failure
15	c ▶	Power interruption to Keep Alive Memory (KAM)
18	c ▶	Loss of tach input to Processor/SPOUT circuit grounded
18	r ▶	SPOUT circuit open
19	o ▶	Failure of EEC power supply
21	or ▶	ECT sensor input is out of Self-Test range
22	orc ▶	MAP sensor input is out of Self-Test range
23	or ▶	TP sensor input is out of Self-Test range
24	or ▶	ACT sensor input is out of Self-Test range
26	or ▶	TOT sensor input is out of Self-Test range
29	c ▶	Insufficient input from the Vehicle Speed Sensor (VSS)
31	orc ▶	EVP circuit is below minimum voltage
32	orc ▶	EVP voltage is below closed limit (SONIC)
33	rc ▶	EGR valve is not opening (SONIC)
34	orc ▶	EVP voltage is above closed limit (SONIC)
35	orc ▶	EVP circuit is above maximum voltage
41	r ▶	HEGO sensor circuit indicates system lean
41	c ▶	No HEGO switching detected
42	r ▶	HEGO sensor circuit indicates system rich
44	r ▶	Thermactor air system inoperative
47	o ▶	4 x 4 switch is closed
49	c ▶	1-2 shift error
51	oc ▶	ECT sensor input is greater than Self-Test maximum
53	oc ▶	TP sensor input is greater than Self-Test maximum
54	oc ▶	ACT sensor input is greater than Self-Test maximum
56	oc ▶	TOT sensor input is greater than Self-Test maximum
59	c ▶	2-3 shift error
61	oc ▶	ECT sensor input is less than Self-Test minimum
62	c ▶	Converter clutch failure
63	oc ▶	TP sensor input is less than Self-Test minimum
64	oc ▶	ACT sensor input is less than Self-Test minimum
65	r ▶	Overdrive Cancel Switch (OCS) not changing state
66	oc ▶	TOT sensor input is less than Self-Test minimum
67	oc ▶	MLP sensor out of range; A/C input high
69	c ▶	3-4 shift error

(Continued)

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Quick Test Codes and Code Definition

7.5L E4OD EFI

SERVICE CODE	SERVICE CODE DEFINITION
72 r ▶	Insufficient MAP output change during Dynamic Response Test
73 r ▶	Insufficient TP output change during Dynamic Response Test
74 r ▶	Brake On/Off (BOO) circuit open - not actuated during test
77 r ▶	Brief WOT not sensed during Self-Test/Operator error
82 o ▶	Air Management 1 (AM1) circuit failure
84 o ▶	EGR Vacuum Regulator (EVR) circuit failure
85 o ▶	Canister Purge (CANP) circuit failure
87 oc ▶	Fuel pump primary circuit failure
91 o ▶	Shift Solenoid 1 (SS1) circuit failure
92 o ▶	Shift Solenoid 2 (SS2) circuit failure
93 o ▶	Coast Clutch Solenoid (CCS) circuit failure
94 o ▶	Converter Clutch Control (CCC) solenoid circuit failure
95 oc ▶	Fuel pump secondary circuit failure
96 oc ▶	Fuel pump secondary circuit failure
97 o ▶	Overdrive Cancel Indicator Light (OCIL) circuit failure
98 o ▶	Electronic Pressure Control (EPC) driver failure in Processor
98 r ▶	Hard fault is present
99 oc ▶	Electronic Pressure Control (EPC) circuit failure
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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SECTION 17

EEC-IV—Pinpoint Tests—All Vehicles

Contents

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Pinpoint Test Index

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EEC-IV No Start	Pinpoint Test	A

Note

You should enter this Pinpoint Test only when Steps 1.0 through 3.0 have been successfully completed and the engine is still a no start.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Fuel: quantity and quality
- Ignition: general condition, moisture, cracks, damage, etc.
- Engine: internal, valves, timing belt, camshaft
- Starter and battery circuit
- Dual hall sensor
- TFI or DIS module
- Distributor
- Camshaft sensor (CID)
- Single hall crankshaft sensor (PIP)
- Ignition coil or DIS coil

This Pinpoint Test is intended to diagnose only the following:

- Spark (as related to EEC-IV)
- Circuits: PIP, SPOUT, IGNITION GROUND, VPWR
- Processor assembly (-12A650-)

**NOTE: This pinpoint test is intended to diagnose TFI ignition systems, Closed Bowl Distributor (CBD) with remote mount TFI systems and Distributorless Ignition Systems (DIS).
To identify your system, please refer to the application chart below.**

IGNITION SYSTEM APPLICATION CHART:

Ignition Connector	Vehicle Application
DIS Connector (Pins 1-6 and 7-12)	2.3L EFI Truck, 3.0L SHO, 3.8L SC
Distributor Hall Connector and TFI Connector (used for closed bowl distributor, remote mount TFI systems)	3.8L RWD, 3.8L AXOD, 7.5L Truck
TFI Connector	All Others

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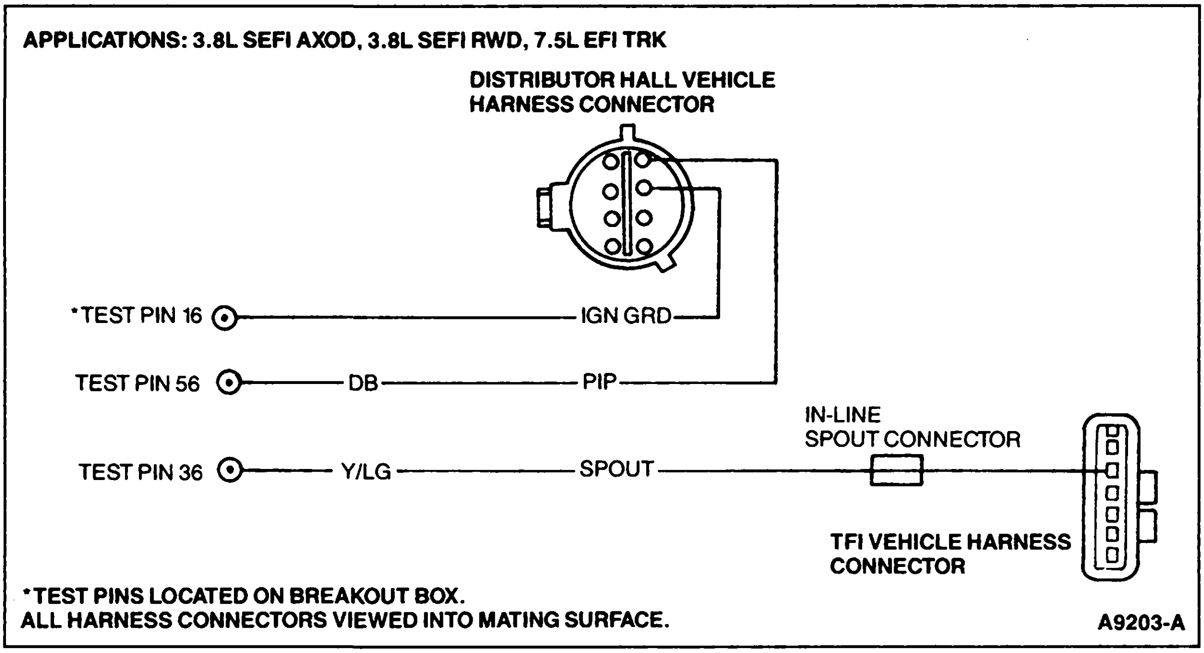
EEC-IV No Start

Pinpoint Test A

Pinpoint Test Schematic



Test Pin 16 **IGN. GND**

Application	Wire Color
3.8L SEFI AXOD	GY
3.8L SEFI RWD 7.5L EFI TRK	BK/O

TFI Location

Application	Location
3.8L SEFI AXOD	Cowl
3.8L SEFI RWD	Radiator Support
7.5L EFI TRK	Distributor

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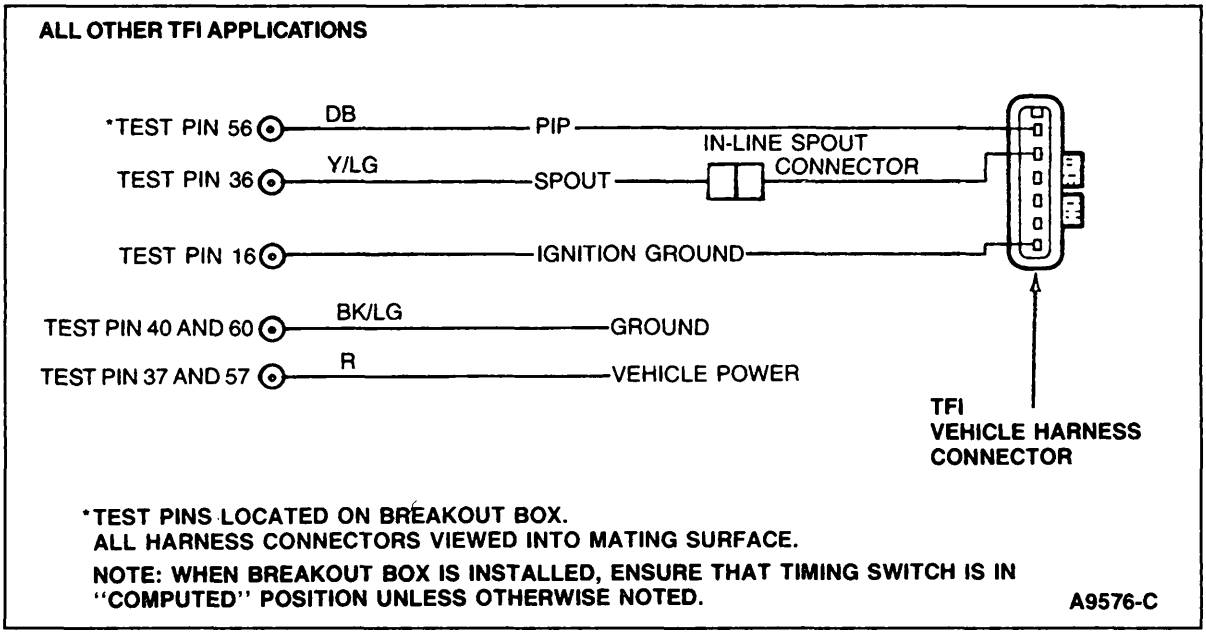
EEC-IV No Start

Pinpoint Test | **A**

Pinpoint Test Schematic



Test Pin 16	IGN. GND
3.0L, 3.8L AXOD	GY
2.9L TK 2.3L TK	BK
2.3L Merkur XR4Ti	R/O
All Others	BK/O

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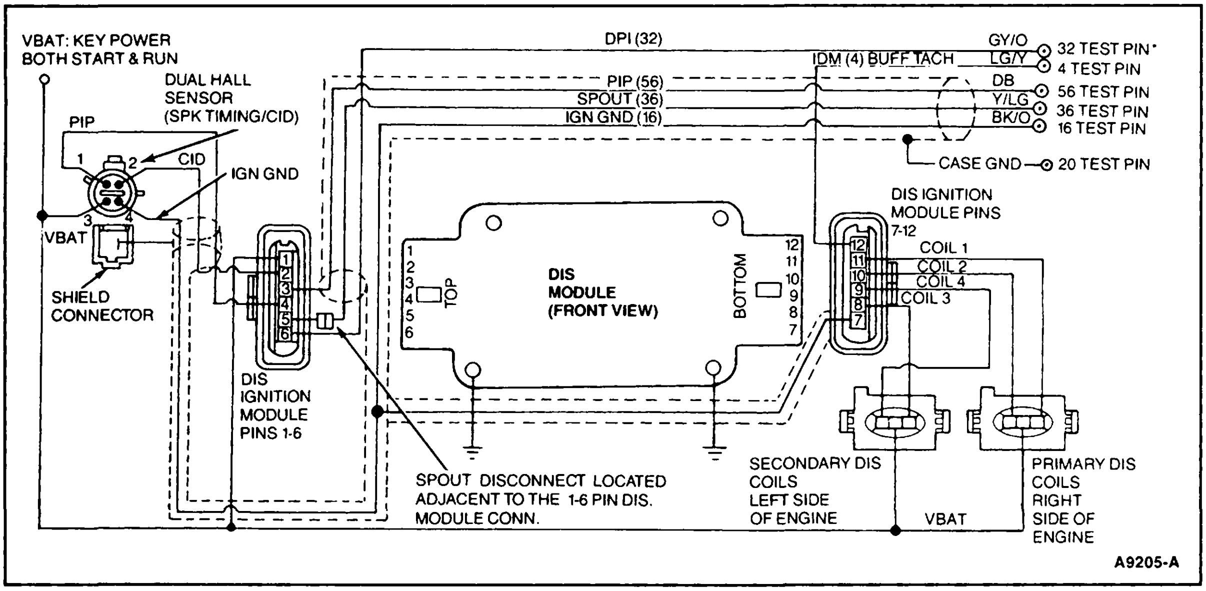
EEC-IV No Start

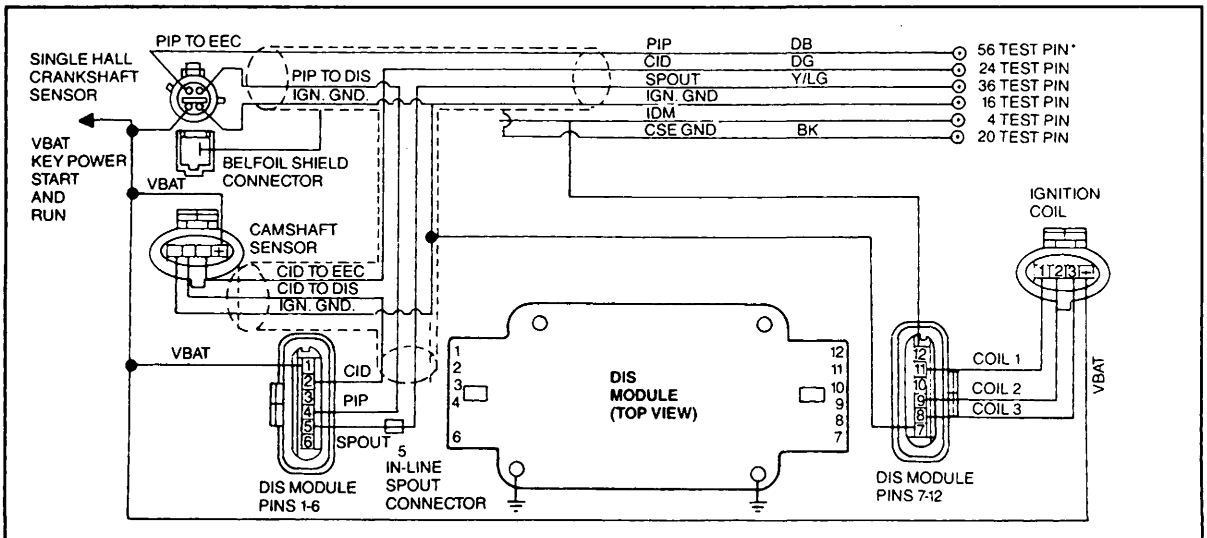
Pinpoint Test | **A**

Pinpoint Test Schematic

2.3 OHC EFI Truck



3.0L SHO SEFI MA and 3.8L SEFI SC



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

Test Pin 4	IDM
3.0L SHO MA	GY/O
3.8L SC MA	DG/Y

Test Pin 16	IGN. GND
3.0L SHO MA	BK/O
3.8L SC MA	LB

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EEC-IV No Start

Pinpoint Test A

WARNING

STOP THIS TEST AT THE FIRST SIGN OF A FUEL LEAK AND SERVICE AS REQUIRED.

CAUTION

No open flame — No smoking during fuel delivery checks.

TEST STEP	RESULT ▶	ACTION TO TAKE
A1 ATTEMPT TO CRANK ENGINE		
NOTE: Verify fuel pump inertia switch is set (button pushed in). Refer to Owner's Guide for location. o **Does engine crank?**	Yes ▶ No ▶	GO to [A2]. REFER to Shop Manual, Group 28 (Group 3 for Compact Truck).
A2 CHECK FOR VREF AT THROTTLE POSITION SENSOR		
o Key off, wait 10 seconds. o DVOM on 20 volt scale. o Disconnect TP sensor. o Key on, engine off. o Measure voltage at the TP vehicle harness connector between VREF and SIGNAL RETURN. o **Is voltage between 4.0 volts and 6.0 volts?** **NOTE: Refer to electrical schematic in appropriate engine supplement section for connector pin orientation.**	Yes ▶ No ▶	RECONNECT TP sensor. GO to [A3]. GO to Pinpoint Test Step [C1].
A3 CHECK FOR SPARK AT PLUGS		
o Disconnect the spark plug wire to any accessible cylinder. (On 2.3L DIS truck, disconnect exhaust side spark plug only.) o Connect spark tester between spark plug wire and engine ground. o Crank engine and check for spark. o Reconnect the spark plug wire to the spark plug. o **Was spark present and consistent?**	Yes ▶ No ▶	GO to [A12]. Vehicles with DIS GO to [A5]. All others GO to [A4].
A4 CHECK FOR SPARK AT COIL		
o Remove high tension coil wire from distributor and install spark tester. o Check for spark while cranking. o Reconnect high tension coil wire to distributor. o **Was spark present during crank?**	Yes ▶ No ▶	REFER to Section 13, Part 2 for TFI Diagnosis for cap, rotor, wires. GO to [A5].

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EEC-IV No Start

Pinpoint Test A

TEST STEP	RESULT ▶	ACTION TO TAKE
A5 CHECK CONTINUITY OF IGNITION GROUND CIRCUIT		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Disconnect TFI or DIS (pins 7-12). (For 3.8L AXOD, 3.8L RWD and 7.5L truck, disconnect distributor hall connector.) • Measure resistance between Test Pin 16 at the breakout box and TFI, distributor hall or DIS vehicle harness connector IGNITION GROUND circuit. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to A6. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
A6 ISOLATION OF PROBLEM TO SPOUT CIRCUIT		
• Breakout box installed. • Connect TFI or DIS (pins 7-12). (For 3.8L AXOD, 3.8L RWD and 7.5L truck, connect distributor hall connector.) • Connect processor to breakout box. • Timing switch to "Dist" position on breakout box. • Attempt to start vehicle. • **Does the vehicle start?**	Yes ▶ No ▶	Timing switch to "computed" position on breakout box. GO to A10. GO to A7.
A7 CHECK SPOUT SIGNAL		
• Key on, engine off. • Breakout box installed, processor connected. • Timing switch to "Computed" position on breakout box. • DVOM on 20 volt scale. • Measure voltage between Test Pin 36 at the breakout box and battery negative post during crank. • **Is voltage between 3.0 and 6.0 volts?**	Yes ▶ No ▶	EEC OK. REMOVE breakout box. RECONNECT all components. REFER to Section 13, for TFI or DIS diagnosis. GO to A8.

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EEC-IV No Start

Pinpoint Test A

TEST STEP	RESULT ▶	ACTION TO TAKE
A8 CHECK SPOUT AND PIP CIRCUITS FOR SHORTS TO POWER AND GROUND		
o Key off, wait 10 seconds. o Breakout box installed. o Disconnect processor. o For 3.0L SHO or 3.8L SC, disconnect PIP sensor. Disconnect TFI or 2.3L TK DIS (pins 1-6). For 3.8L AXOD, 3.8L RWD and 7.5L truck, disconnect TFI and distributor hall connectors. o DVOM on 200,000 ohm scale. Spout Circuit: o Measure resistance between Test Pin 36 (SPOUT) and Test Pins 16, 20, 40, 46, 60 (short to GROUND), 26, 37, 57 (short to POWER) and 56 (short to PIP) at the breakout box. PIP Circuit: o Measure resistance between Test Pin 56 (PIP) and Test Pins 16, 20, 40, 46, 60 (short to GROUND), 26, 37, 57 (short to POWER). o **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to A9 . SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test, if vehicle does not start. GO to A9 .
A9 ISOLATE SHORT(S) IN PROCESSOR		
o Key off, wait 10 seconds. o Breakout box installed. o Reconnect processor to breakout box. o TFI or DIS disconnected. (For 3.8L AXOD, 3.8L RWD and 7.5L truck TFI and distributor hall disconnected.) o DVOM on 200,000 ohm scale. Spout Circuit: o Measure resistance between Test Pin 36 (SPOUT) and Test Pins 37 and 57 (short to POWER) also, Test Pins 40 and 60 (short to GROUND) at the breakout box. PIP Circuit: o Measure resistance between Test Pin 56 (PIP) and Test Pins 37 and 57 (short to POWER). Also Test Pins 40 and 60 (short to GROUND) at the breakout box. o **Are all resistances greater than 500 ohms?**	Yes ▶ No ▶	RECONNECT all components. GO to A10 . REMOVE breakout box. REPLACE processor. RECONNECT all components. RERUN Quick Test.

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EEC-IV No Start

Pinpoint Test **A**

TEST STEP	RESULT ▶	ACTION TO TAKE
A10 CHECK PIP SIGNAL		
• Key off. • Breakout box installed, processor connected. • DVOM to 20 volt scale. • Measure voltage between Test Pin 56 and Test Pin 16 at the breakout box. (For 2.3L DIS truck, switch timing switch to "DIST" position on breakout box.) • Crank engine, record reading. • **Is voltage between 3.0 and 7.0 volts?**	Yes ▶ No ▶	REMOVE breakout box. REPLACE processor. RECONNECT all components. RERUN Quick Test. GO to **A11**. (For 2.3L DIS truck, switch timing switch to "computed" position on breakout box.)
A11 CHECK CONTINUITY OF PIP CIRCUIT		
• Key off, wait 10 seconds. • Breakout box installed. • Disconnect processor. • On 3.8L SC or 3.0L SHO, disconnect PIP sensor. Disconnect TFI or 2.3L TK DIS (pins 1-6). For 3.8L AXOD, 3.8L RWD and 7.5L truck, disconnect distributor hall connector. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 56 at the breakout box and the following connectors as appropriate: TFI, distributor hall, PIP sensor, or 2.3L TK DIS PIP circuit. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT all components. REFER to Section 13 for TFI or DIS diagnosis. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
A12 SPOUT SIGNAL VERIFICATION		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box. • Reconnect processor to breakout box. • DVOM on 20 volt scale. • Measure voltage between Test Pin 36 and Test Pins 40 and 60 at the breakout box during crank. • Ensure timing switch is in "Computed" position on breakout box. • **Is voltage between 3.0 and 6.0 volts?**	Yes ▶ No ▶	GO to **A20**. GO to **A8**.

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EEC-IV No Start

Pinpoint Test **A**

TEST STEP	RESULT ▶	ACTION TO TAKE
A20 CHECK FUEL PUMP		
o **No smoking nearby.** o Connect fuel pressure gauge. o Note initial pressure reading. o Observe pressure gauge as you pressurize fuel system. (Turn key to RUN for 1 second, then turn key to OFF. Wait 10 seconds. Repeat 5 times.) o **Does fuel pressure increase?** **WARNING** **IF FUEL STARTS LEAKING, TURN KEY OFF IMMEDIATELY. NO SMOKING.**	Yes ▶ No ▶	All SEFI GO to Pinpoint Test Step **S1** . All CFI GO to Pinpoint Test Step **S2** . TURN key OFF, and CONTINUE to **A21** .
A21 CHECK INERTIA SWITCH		
o Key off. o Locate and disconnect fuel pump inertia switch. Refer to Owner Guide for location. o DVOM on 200 ohm scale. o Measure the resistance of the fuel pump inertia switch. o **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	o 2.5L HSC-CFI, 3.0L EFI and 3.8L AXOD EFI passenger car GO to **X-11** . o All others, GO to **J1** . VERIFY inertia switch is reset. If switch will not reset, REPLACE switch. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Vehicle Battery

Pinpoint Test B

Note

You should enter this Pinpoint Test only when directed here from Pinpoint Tests C, J or P.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Ignition Switch
- Battery Cables
- Alternator
- Voltage Regulator
- Ground Straps

This Pinpoint Test is intended to diagnose only the following:

- Processor (-12A650-)
- Harness circuits: SIGNAL RETURN, STO, STI, GROUND, VPWR, KAPWR, VREF, IGNITION
- Battery Voltage
- Power Relay (-12A646-)

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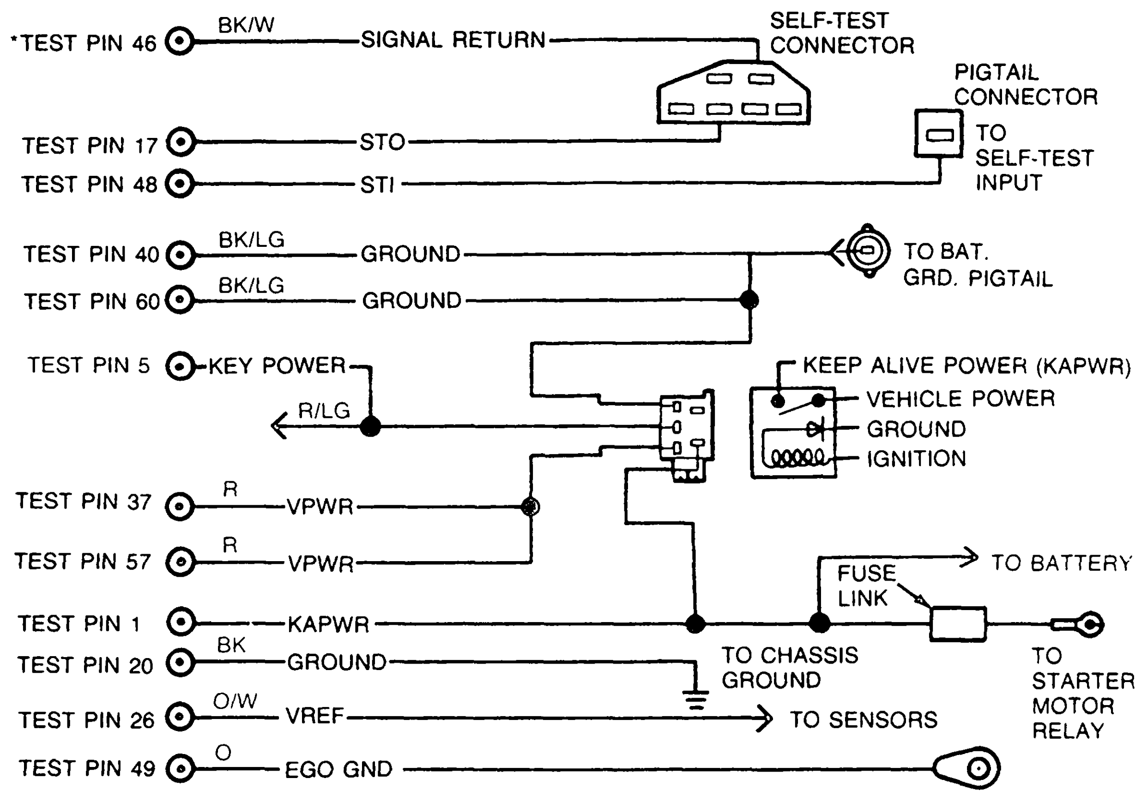
Vehicle Battery	Pinpoint Test	B

Pinpoint Test Schematic



***TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9577-D

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Vehicle Battery

Pinpoint Test **B**

Test Pin 17 **STO**

Application	Wire Color
Car: 1.9L EFI	T/LB
2.3L TC 3.8L RWD-SEFI 3.8L SEFI-SC 5.0L SEFI, Mark VII	Y/BK
2.3L OHC EFI 5.0L MA	T
Truck: F-Series	PK/LG
All Others	T/R

Test Pin 1 **KAPWR**

Application	Wire Color
Car: 2.3 OHC, EFI 5.0L SEFI, Mark VII 5.0L SEFI-MA Truck: 5.0L EFI, E-Series	BK/O
All Others	Y

Test Pin 48 **STI**

Application	Wire Color
Car: 2.5L CFI CLC 2.5L CFI MTX 3.0L EFI 3.8L SEFI MA 5.0L SEFI, Crown Victoria and Grand Marquis Town Car	W/BK
All Others	W/R

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Vehicle Battery

Pinpoint Test B

TEST STEP	RESULT ▶	ACTION TO TAKE
B1 BATTERY VOLTAGE CHECK		
o Key on, engine off. o DVOM on 20 volt scale. o Measure voltage across battery terminals. o **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to B2. SERVICE discharged battery. REFER to Shop Manual, Group 31 (Group 14 for Compact Truck).
B2 CHECK EEC GROUND TO BATTERY GROUND		
o Key off, wait 10 seconds. o Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o Install breakout box and connect processor to breakout box. o DVOM on 200 ohm scale. o Measure resistance between Test Pin 40 at the breakout box and negative post of the battery and Test Pin 60 at the breakout box and negative post of the battery. o **Are both resistances less than 5 ohms?**	Yes ▶ No ▶	GO to B3. REMOVE breakout box. RECONNECT processor. SERVICE open in EEC ground circuit. RERUN Quick Test.
B3 PROCESSOR GROUND ISOLATION		
o Key off, wait 10 seconds. o Breakout box installed, processor connected. o DVOM on 200 ohm scale. o Measure resistance between Test Pin 46 and Test Pin 40 and between Test Pin 46 and Test Pin 60 both at the breakout box. o **Are both resistances less than 5 ohms?**	Yes ▶ No ▶	GO to B4. REMOVE breakout box. REPLACE processor. RERUN Quick Test.

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Vehicle Battery

Pinpoint Test B

TEST STEP	RESULT ▶	ACTION TO TAKE
B4 CHECK CONTINUITY OF SIGNAL RETURN CIRCUIT		
• Key off, wait 10 seconds. • Breakout box installed, processor connected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 46 at the breakout box and SIGNAL RETURN in the Self-Test connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to B5. REMOVE breakout box. RECONNECT processor. SERVICE open circuit. RERUN Quick Test.
B5 CHECK KEEP ALIVE POWER (KAPWR) CIRCUIT FOR VOLTAGE		
• Key on, engine off. • Breakout box installed, processor connected. • DVOM on 20 volt scale. • Measure voltage between Test Pin 1 at the breakout box and the battery negative post. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to B6. CHECK KAPWR and VPWR circuits for shorts to ground and KAPWR circuit from power relay to battery positive post for opens. SERVICE as necessary. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.
B6 CHECK IGNITION CIRCUIT FOR VOLTAGE		
• Key on, engine off. • Breakout box installed, processor connected. • DVOM on 20 volt scale. • Measure voltage between the battery negative post and IGNITION circuit at EEC power relay. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to B7. SERVICE open in ignition switch circuits. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.

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Vehicle Battery	Pinpoint Test	B

TEST STEP	RESULT ▶	ACTION TO TAKE
B7 CHECK CONTINUITY OF EEC POWER RELAY GROUND CIRCUIT		
• Key off, wait 10 seconds. • Breakout box installed, processor connected. • DVOM on 200 ohm scale. • Measure resistance between GROUND circuit at the EEC power relay and negative battery post. • **Is the resistance less than 5 ohms?**	Yes ▶	GO to B8 .
	No ▶	SERVICE open circuit. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.
B8 CHECK VOLTAGE OF VPWR CIRCUIT AT EEC POWER RELAY		
• Key on, engine off. • Breakout box installed, processor connected. • DVOM on 20 volt scale. • Measure voltage between the battery negative post and VPWR circuit at EEC power relay. • **Is the voltage greater than 10.5 volts?**	Yes ▶	SERVICE open in VPWR circuit, if OK, SERVICE short to ground in VPWR circuit. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.
	No ▶	REPLACE power relay. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.

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Reference Voltage

Pinpoint Test C

Note

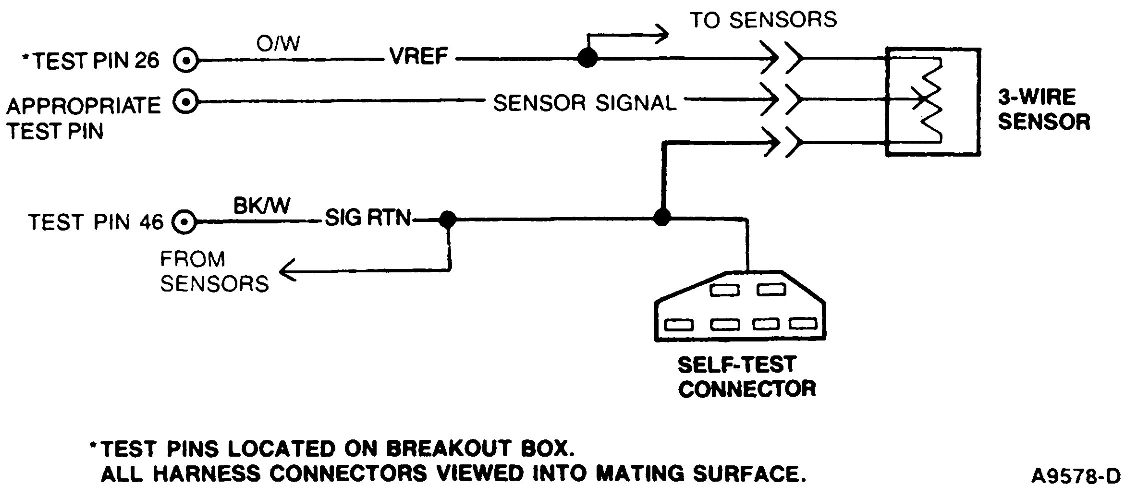
You should enter this Pinpoint Test only when a check for VREF has failed in the sensor Pinpoint Tests (D-Series) or Pinpoint Tests A or QA.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Processor (-12A650-)
- Sensor harness circuits: SIGNAL RETURN, VREF

Pinpoint Test Schematic



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Reference Voltage — Pinpoint Test C

TEST STEP	RESULT	ACTION TO TAKE
C1 CHECK VEHICLE BATTERY POWER CIRCUIT o Key off, wait 10 seconds. o Disconnect 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o Install breakout box and connect processor to breakout box. o Key on, engine off. o DVOM on 20 volt scale. o Measure voltage between Test Pin 37 at the breakout box and SIGNAL RETURN in Self-Test connector. o **Is voltage greater than 10.5 volts?**	Yes ▶	GO to C2.
	No ▶	RECONNECT SENSOR. 2.5L HSC CFI, 3.0L EFI car, 3.0L SHO, 3.8L AXOD and 3.8L S/C GO to X-1. All others, GO to B1.
C2 CHECK VREF VOLTAGE o Key on, engine off. o Breakout box installed, processor connected. o DVOM on 20 volt scale. o Measure voltage between Test Pin 26 and Test Pin 46 at the breakout box. o **What is the voltage?**	Greater than 6.0 volts ▶	GO to C4.
	Less than 4.0 volts ▶	GO to C5.
	Between 4.0 volts and 6.0 volts ▶	GO to C3.
C3 CHECK VREF AND SIGNAL RETURN FOR CONTINUITY o Key off. o Breakout box installed. o Disconnect processor. o Sensor that sent you here disconnected. o DVOM on 200 ohm scale. o Measure resistance from Test Pin 26 at breakout box to VREF at vehicle harness connector of the sensor that sent you here. o Measure resistance from Test Pin 46 at breakout box to signal return at vehicle harness connector of the sensor that sent you here. o **Are both resistances less than 5.0 ohms?**	Yes ▶	RECONNECT sensors. Reference voltage OK. RERUN Quick Test.
	No ▶	SERVICE open in VREF or SIGNAL RETURN. REMOVE breakout box. RECONNECT processor and sensor. RERUN Quick Test.

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Reference Voltage — Pinpoint Test C

TEST STEP	RESULT ▶	ACTION TO TAKE
C4 CHECK FOR EXCESS VOLTAGE ON VREF CIRCUIT		
• Key off, wait 10 seconds. • Breakout box installed. • Disconnect processor. • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between Test Pin 26 at the breakout box and battery ground. • **Is voltage less than 0.5 volts?**	Yes ▶	REMOVE breakout box. RECONNECT sensor. REPLACE processor. RERUN Quick Test.
	No ▶	SERVICE short to battery power in EEC harness. REMOVE breakout box. RECONNECT processor and sensor. RERUN Quick Test. If condition persists, REPLACE processor.
C5 CHECK FOR SHORTED THROTTLE POSITION SENSOR		
• Key off, wait 10 seconds. • Breakout box installed, processor connected. • Disconnect Throttle Position (TP) sensor from vehicle harness. • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between Test Pin 26 and Test Pin 46 at the breakout box. • **Is voltage less than 4.0 volts?**	Yes ▶	Vehicles equipped with EVP/PFE sensor, GO to C6 . All other vehicles, GO to C7 .
	No ▶	REPLACE TP sensor. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.
C6 CHECK FOR SHORTED EVP/PFE SENSOR		
• Key off, wait 10 seconds. • Breakout box installed, processor connected. • Disconnect EVP/PFE sensor. • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between Test Pin 26 and Test Pin 46 at the breakout box. • **Is voltage less than 4.0 volts?**	Yes ▶	GO to C7 .
	No ▶	REPLACE EVP/PFE sensor. REMOVE breakout box. RECONNECT processor and sensor(s). RERUN Quick Test.

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Reference Voltage

Pinpoint Test C

TEST STEP	RESULT ▶	ACTION TO TAKE
C7 CHECK FOR SHORTED MAP/BP SENSOR		
• Key off, wait 10 seconds. • Breakout box installed, processor connected. • Disconnect MAP/BP sensor. • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between Test Pin 26 and Test Pin 46 at the breakout box. • **Is voltage less than 4.0 volts?**	Yes ▶	Vehicles equipped with VAF sensor, GO to C8. All other vehicles, GO to C9.
	No ▶	REPLACE MAP/BP sensor. REMOVE breakout box. RECONNECT processor and sensor(s). RERUN Quick Test.
C8 CHECK FOR SHORTED VANE AIR METER (VAF) SENSOR		
• Key off, wait 10 seconds. • Breakout box installed, processor connected. • Disconnect vane air meter (VAF) sensor. • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between Test Pin 26 and Test Pin 46 at the breakout box. • **Is voltage less than 4.0 volts?**	Yes ▶	GO to C9.
	No ▶	REPLACE VAF sensor. REMOVE breakout box. RECONNECT processor and sensor(s). RERUN Quick Test.
C9 SHORT TO GROUND IN VREF		
• Key off, wait 10 seconds. • Breakout box installed. • Disconnect processor. • Disconnect TP and MAP/BP, EVP/PFE and VAF, if so equipped. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 26 and Test Pins 20, 40, 46 and 60 at the breakout box. • **Is any resistance less than 5 ohms?**	Yes ▶	REMOVE breakout box. RECONNECT processor. SERVICE short to ground. CONNECT all sensors. RERUN Quick Test. If original condition still exists, REPLACE processor.
	No ▶	REMOVE breakout box. RECONNECT sensors. REPLACE processor. RERUN Quick Test.

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Vane Air Temperature Sensor (VAT)

Pinpoint Test **DA**

Note

You should enter this Pinpoint Test only when a Service Code 24, 28, 54, 58, 64 or 68 is received in Quick Test Step 3.0, 5.0 or 6.0.

Remember

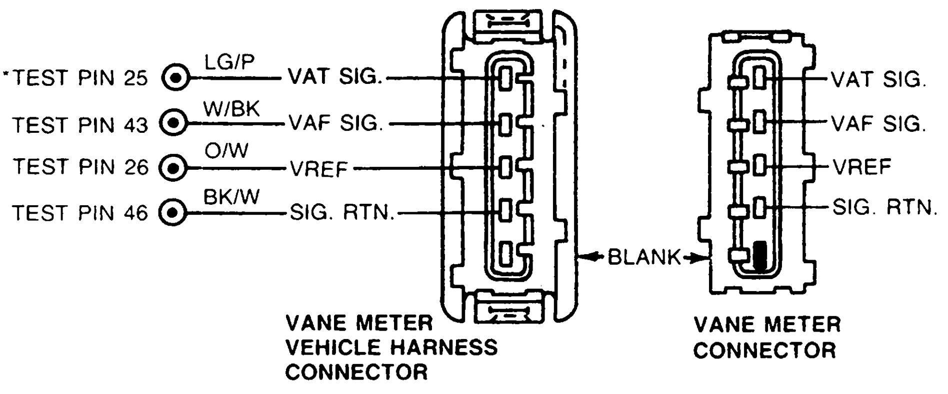
To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Test performed in unusually low (cold) or high (hot) ambient conditions.
- Ambient temperature must be greater than 50°F for this test.

This Pinpoint Test is intended to diagnose only the following:

- VAT sensor (-12B529-)
- Circuits: VAT, and SIGNAL RETURN
- Vehicle harness
- Processor assembly (-12A650-)

Pinpoint Test Schematic



NOTE: AMBIENT TEMPERATURE MUST BE GREATER THAN 50°F TO PASS THIS TEST.

TYPICAL RESISTANCE BETWEEN TEST PINS 25 (OR 43) & 46	5800 ohms	2700 ohms	300 ohms	180 ohms	125 ohms
AT TEMPERATURE	32°F	65°F	185°F	220°F	240°F

***TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9579-D

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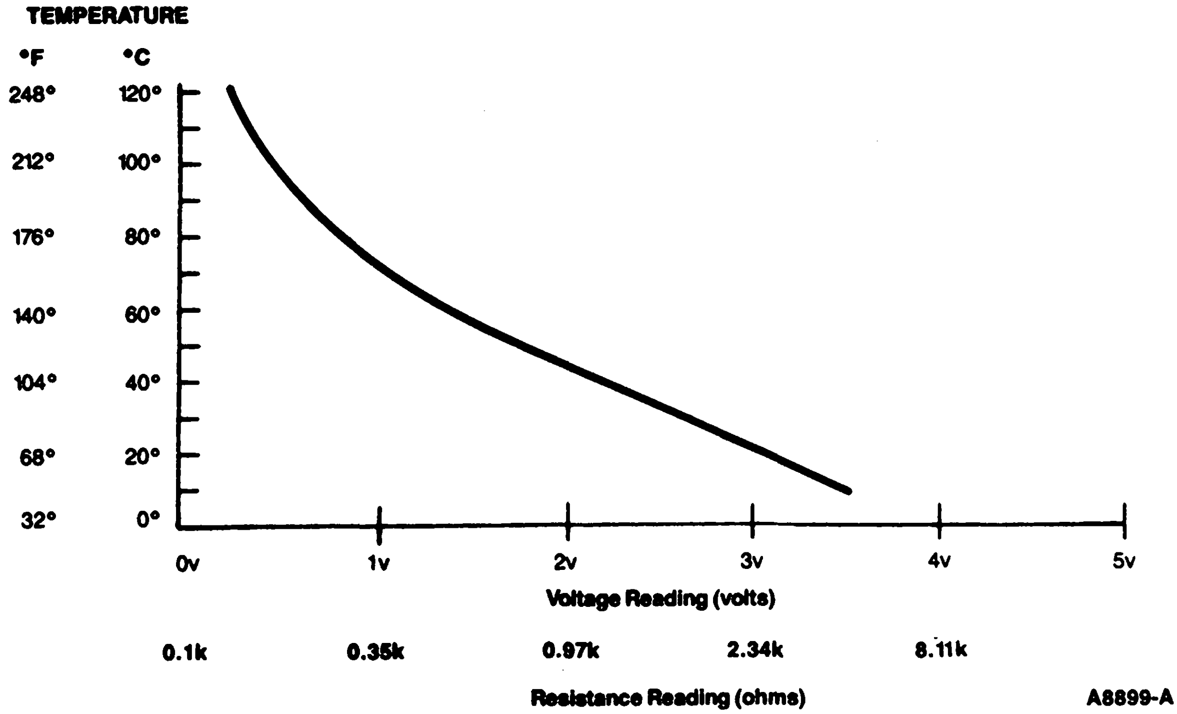
Vane Air Temperature Sensor (VAT) | Pinpoint Test | DA

NOTE: Voltage values calculated for VREF = 5.0 volts. (These values may vary ±15 percent due to sensor and VREF variations.)

VAT Sensor Graph



VAT Sensor Data

TEMPERATURE		VOLTAGE	RESISTANCE
°F	°C	Volts	K ohms
248	120	0.38	0.11
230	110	0.46	0.14
212	100	0.56	0.19
194	90	0.76	0.25
176	80	0.95	0.33
158	70	1.19	0.44
140	60	1.49	0.60
122	50	1.84	0.83
104	40	2.23	1.18
86	30	2.65	1.70
68	20	3.07	2.50
50	10	3.46	3.77

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Vane Air Temperature Sensor (VAT) — Pinpoint Test DA

TEST STEP	RESULT ▶	ACTION TO TAKE
DA1 SERVICE CODE 24 OR 28: CHECK AMBIENT TEMPERATURE		
Service code 24 and 28 indicate that the vane air temperature (VAT) sensor is out of Self-Test range. Correct range of measurement is 0.35 to 3.5 volts. Possible causes: — Ambient temperature below 50°F — Faulty vane meter — Faulty processor — Faulty connector harness • **Is the ambient temperature greater than 50°F?**	Yes ▶ No ▶	GO to DA2 . RERUN Quick Test.
DA2 CHECK FOR VREF AT THROTTLE POSITION SENSOR		
• Refer to illustration QA. • Key off, wait 10 seconds. • Disconnect TP sensor. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between VREF and SIGNAL RETURN at the TP vehicle harness connector. • **Is voltage between 4.0 volts and 6.0 volts?**	Yes ▶ No ▶	RECONNECT TP sensor, GO to DA3 . GO to Pinpoint Test Step C1 .

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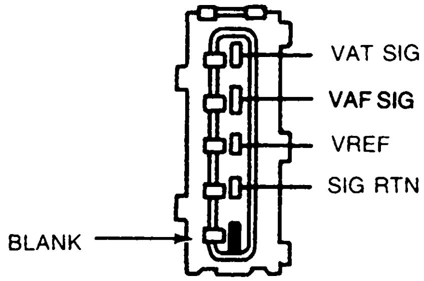
Vane Air Temperature Sensor (VAT)

Pinpoint Test DA

TEST STEP	RESULT ▶	ACTION TO TAKE
DA3 VAT SENSOR CHECK		
NOTE: Ambient temperature must be greater than 50°F for this test. • Key off, wait 10 seconds. • Disconnect harness from the vane meter. • DVOM on 200,000 ohm scale. • Measure resistance between VAT signal and SIGNAL RETURN at the VAT sensor. • **Is resistance between 125 ohms (240°F) and 3700 ohms (50°F)?**  **VANE METER CONNECTOR** **A8898-A**	Yes ▶ No ▶	REPLACE processor. RECONNECT harness to vane meter. RERUN Quick Test. REFER to Section 3, Vane Air Meter Diagnosis.
DA10 SERVICE CODE 54 OR 58: INDUCE OPPOSITE CODE		
Service code 54 and 58 indicate that the vane air temperature (VAT) sensor signal is greater than the Self-Test maximum of 3.5 volts (temperature too low). Possible causes: — Lack of continuity between vane meter harness connector and processor — Faulty vane meter — Faulty processor • Key off, wait 10 seconds. • Disconnect vehicle harness from vane meter. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. • Insert a jumper wire (paper clip) between VAT SIGNAL and SIGNAL RETURN at the vane meter vehicle harness connector. • Rerun Key On Engine Off Self-Test. • **Is Code 64 or 68 present?**	Yes ▶ No ▶	REPLACE vane meter. REMOVE jumper wire. CONNECT harness to vane meter. RERUN Quick Test. REMOVE jumper wire. GO to **DA11**.

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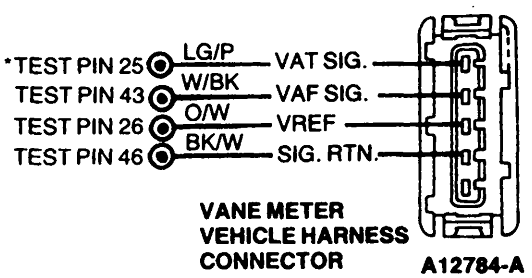
Vane Air Temperature Sensor (VAT) | Pinpoint Test | DA

TEST STEP	RESULT ▶	ACTION TO TAKE
DA11 CHECK CONTINUITY OF VAT SIGNAL AND SIGNAL RETURN		
• Key off, wait 10 seconds. • Harness disconnected from vane meter, jumper wire removed. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between VAT SIGNAL at the vane meter vehicle harness connector, and Test Pin 25 at the breakout box. • Measure resistance between SIGNAL RETURN at the vane meter vehicle harness connector, and Test Pin 46 at the breakout box. • **Are both resistances less than 5 ohms?**	Yes ▶	REPLACE processor. REMOVE breakout box. RECONNECT harness to vane meter and processor. RERUN Quick Test.
	No ▶	CORRECT open circuit. REMOVE breakout box. RECONNECT harness to vane meter and processor. RERUN Quick Test.



TEST STEP	RESULT ▶	ACTION TO TAKE
DA20 SERVICE CODE 64 OR 68: INDUCE OPPOSITE CODE		
Service code 64 and 68 indicate that the vane air temperature (VAT) sensor signal is less than the Self-Test minimum value of 0.35 volts (temperature is too high). Possible causes: — VAT signal output shorted to SIGNAL RETURN, GROUND or VREF — Faulty vane meter — Faulty processor • Key off, wait 10 seconds. • Disconnect vehicle harness from vane meter. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Run Key On Engine Off Self-Test. • **Is Code 54 or 58 present?**	Yes ▶	REPLACE vane meter. RECONNECT harness to vane meter. RERUN Quick Test.
	No ▶	GO to $\boxed{\text{DA21}}$.

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Vane Air Temperature Sensor (VAT)

Pinpoint Test **DA**

TEST STEP	RESULT ▶	ACTION TO TAKE
DA21 CHECK FOR VREF AT THROTTLE POSITION SENSOR		
o Refer to illustration QA. o Key off, wait 10 seconds. o Disconnect TP sensor. o DVOM on 20 volt scale. o Key on, engine off. o Measure voltage at the TP vehicle harness connector between VREF and SIGNAL RETURN. o **Is voltage between 4.0 volts and 6.0 volts?**	Yes ▶ No ▶	RECONNECT TP sensor, GO to DA22. GO to Pinpoint Test Step C1.
DA22 CHECK VAT SIGNAL FOR SHORTS		
o Key off, wait 10 seconds. o Harness disconnected from vane meter. o Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o Install breakout box, leave processor disconnected. o DVOM on 200,000 ohm scale. o Measure resistance between Test Pin 25 and Test Pins 40, 46 and 60 at the breakout box. o **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT processor. RERUN Quick Test. CORRECT circuit shorts. REMOVE breakout box. RECONNECT processor and vane meter. RERUN Quick Test.

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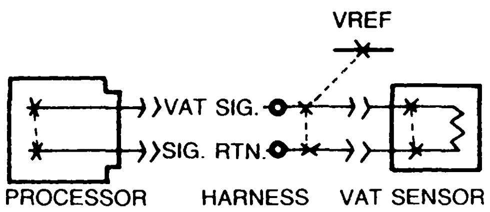
Vane Air Temperature Sensor (VAT) | Pinpoint Test | DA

TEST STEP	RESULT ▶	ACTION TO TAKE
DA90 CONTINUOUS MEMORY CODE 54 OR 58: CHECK VAT SENSOR		
Continuous Memory Codes 54 and 58 indicate that the vane air temperature signal was greater than the Self-Test maximum of 4.5 volts. The code was set during normal driving conditions. Possible causes: — Faulty EEC-IV harness — Faulty processor — Faulty vane meter connectors and/or terminals — Faulty vane meter — Faulty processor connectors and/or terminals • Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: — Lightly tap on vane meter (simulate road shock). — Wiggle connector at vane meter. • **Is a fault indicated?**	Yes ▶ No ▶	DISCONNECT and INSPECT connectors. If connector and terminals are good, REPLACE vane meter. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test. GO to DA91.
DA91 CHECK EEC-IV HARNESS		
• Still in Key On Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: — Referring to the illustration in Step DA90, grasp the harness closest to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV harness from the dash panel to the processor. • **Is a fault indicated?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory. Refer to Quick Test Appendix. RERUN Quick Test. GO to DA92.



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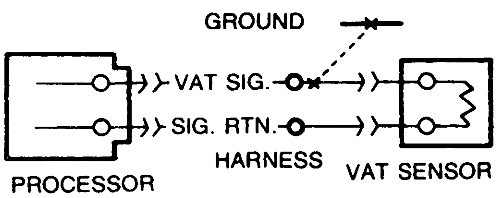
Vane Air Temperature Sensor (VAT)

Pinpoint Test DA

TEST STEP	RESULT ▶	ACTION TO TAKE
DA92 CHECK PROCESSOR AND HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. • Inspect both connectors and connector terminals for obvious damage or faults. • **Are connectors and terminals OK?**	No ▶	SERVICE as necessary. CLEAR Continuous Memory. Refer to Quick Test Appendix. RERUN Quick Test.
	Yes ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.
DA93 CONTINUOUS MEMORY CODE 64 or 68: CHECK VAT SENSOR		
Continuous Memory Codes 64 and 68 indicate that the vane air temperature signal was less than the Self-Test minimum of 0.3 volts. The code was set during normal driving conditions. Possible causes: — Faulty EEC-IV harness — Faulty vane meter — Faulty processor — Faulty vane meter connectors and/or terminals — Faulty processor connectors and/or terminals • Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: — Lightly tap on vane meter (simulate road shock). — Wiggle connector at vane meter. • **Is fault indicated?**	Yes ▶	DISCONNECT and INSPECT connectors. If connector and terminals are good, REPLACE vane meter. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.
	No ▶	GO to DA94 .



A9580-C

* Can be purchased as a separate item.

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Vane Air Temperature Sensor (VAT) — Pinpoint Test DA

TEST STEP	RESULT ▶	ACTION TO TAKE
DA94 CHECK EEC-IV HARNESS		
• Still in Key On Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: — *Referring to the illustration in Step* DA93, grasp the harness closest to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV harness from the dash panel to the processor. • **Is a fault indicated?**	Yes ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.
	No ▶	GO to DA95.
DA95 CHECK PROCESSOR AND HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. • Inspect connectors and connector terminals for obvious damage or faults. • **Are connectors and terminals OK?**	No ▶	SERVICE as necessary. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.
	Yes ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.

* Can be purchased as a separate item.

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Air Charge Temperature Sensor (ACT)

Pinpoint Test

DB

Note

You should enter this Pinpoint Test only when a Service Code 24, 54 or 64 is received in Quick Test Step 3.0, 5.0 or 6.0.

Remember

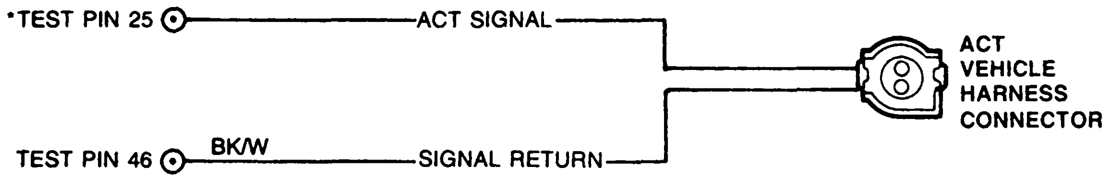
To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Ambient temperature below 50°F
- Cooling system
- Air cleaner duct problems
- Improper engine oil level

This Pinpoint Test is intended to diagnose only the following:

- ACT sensor (-12A697-)
- Harness circuits: ACT SIGNAL and SIGNAL RETURN
- Processor assembly (-12A650-)

Pinpoint Test Schematic



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9581-D

Test Pin 25	ACT Signal
Application	**Wire Color**
Truck: 2.3L, 4.9L, 5.0L 5.8L, 7.5L	Y/R
2.3L OHC EFI	LG/R
All Others	LG/P

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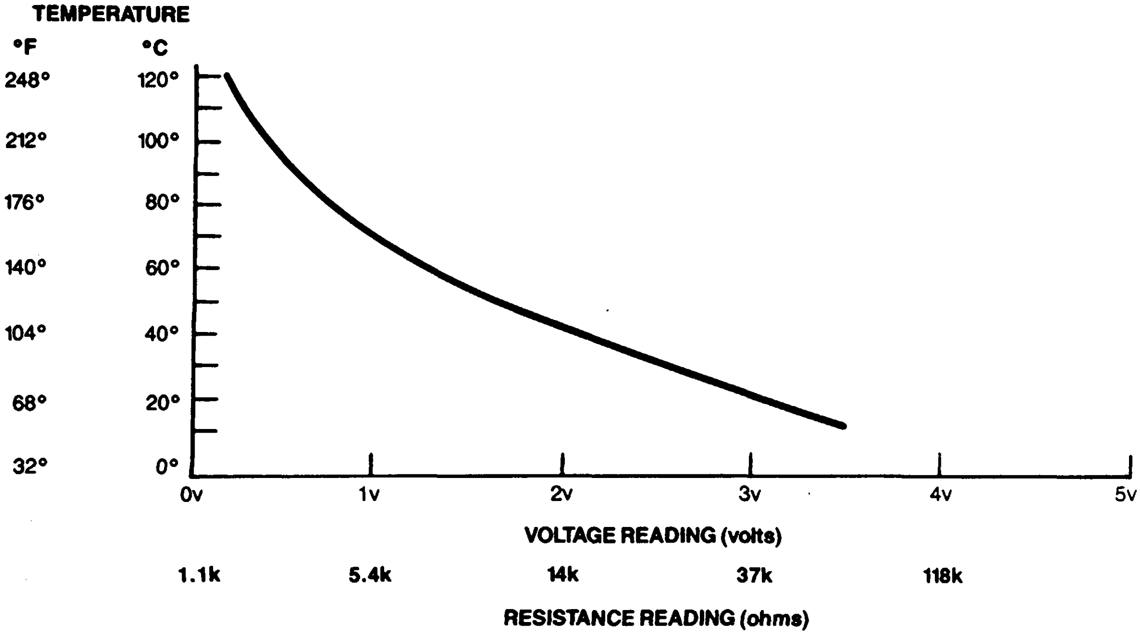
Air Charge Temperature Sensor (ACT)

Pinpoint Test DB

NOTE: Ambient temperature must be greater than 50°F. Voltage values calculated for VREF = 5.0 volts. (These values may vary ±15 percent due to sensor and VREF variations.)

ACT Sensor Graph



A8900-A

ACT Sensor Data

Temperature		Voltage	Resistance
°F	°C	Volts	K ohms
248	120	.27	1.18
230	110	.35	1.55
212	100	.46	2.07
194	90	.60	2.80
176	80	.78	3.84
158	70	1.02	5.37
140	60	1.33	7.70
122	50	1.70	10.97
104	40	2.13	16.15
86	30	2.60	24.27
68	20	3.07	37.30
50	10	3.51	58.75

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Air Charge Temperature Sensor (ACT) — Pinpoint Test DB

TEST STEP	RESULT ▶	ACTION TO TAKE
DB1 SERVICE CODE 24: CHECK PROPER INSTALLATION OF ACT SENSOR		
Service Code 24 indicates that the Air Charge Temperature Sensor (ACT) is out of Self-Test range. Correct range of measurement is 0.3 to 3.7 volts. Possible causes are: — ACT resistance is out of limits — Faulty processor o For vehicles with ACT sensor mounted in the intake manifold, GO to step DB2. o **Is ACT sensor mounted properly in the air cleaner?**	Yes ▶ No ▶	GO to DB2. INSTALL ACT sensor properly. RERUN Quick Test.
DB2 CHECK FOR VREF AT THROTTLE POSITION SENSOR		
o Refer to schematic in Pinpoint Test DH. o Key off, wait 10 seconds. o DVOM on 20 volt scale. o Disconnect TP sensor. o Key on, engine off. o Measure voltage between VREF and SIGNAL RETURN at the TP sensor vehicle harness connector. o **Is voltage between 4.0 and 6.0 volts?**	Yes ▶ No ▶	RECONNECT TP sensor, GO to DB3. GO to Pinpoint Test Step C1.
DB3 CHECK ACT SENSOR WITH ENGINE OFF		
NOTE: Make sure engine is warmed up prior to this test. o Key off, wait 10 seconds. o Disconnect harness from ACT sensor. o DVOM on 200,000 ohm scale. o Measure resistance of ACT sensor. o **Is resistance between 1,100 and 58,000 ohms?**	Yes ▶ No ▶	GO to DB4. CHECK heat stove duct valve operation. If OK, REPLACE ACT sensor. RECONNECT harness to ACT sensor. RERUN Quick Test.
DB4 CHECK ACT SENSOR WITH ENGINE RUNNING		
o Key off. o Harness disconnected from ACT sensor. o DVOM on 200,000 ohm scale. o Run engine for 2 minutes. o Measure resistance of ACT sensor with engine running. o **Is resistance between 2,400 and 29,000 ohms?**	Yes ▶ No ▶	REPLACE processor. RECONNECT harness to ACT sensor. RERUN Quick Test. CHECK heat stove duct valve operation. If OK, REPLACE ACT sensor. RERUN Quick Test.

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Air Charge Temperature Sensor (ACT) — Pinpoint Test DB

TEST STEP		RESULT ▶	ACTION TO TAKE
DB10	SERVICE CODE 54: ATTEMPT TO GENERATE CODE 64		
	Service Code 54 indicates that the Air Charge Temperature Sensor (ACT) signal is greater than the Self-Test maximum value of 4.6 volts (circuit open). Possible causes are: — Faulty ACT sensor — Open harness — Faulty processor • Key off, wait 10 seconds. • Disconnect vehicle harness from ACT sensor. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Insert a jumper wire at the ACT vehicle harness connector between ACT SIGNAL and SIGNAL RETURN. • Run Key On Engine Off Self-Test. • **Is Code 64 present?**	Yes ▶ No ▶	REPLACE ACT sensor. REMOVE jumper wire. RECONNECT ACT sensor. RERUN Quick Test. REMOVE jumper wire. GO to DB11 .
DB11	CHECK CONTINUITY OF ACT SIGNAL AND SIGNAL RETURN		
	• Key off, wait 10 seconds. • Harness disconnected from ACT sensor. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between ACT SIGNAL, at the ACT vehicle harness connector, and Test Pin 25 at the breakout box. • Measure resistance between SIGNAL RETURN, at the ACT vehicle harness connector, and Test Pin 46 at the breakout box. • **Are both resistances less than 5 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT processor and ACT sensor. RERUN Quick Test. SERVICE open circuit(s). REMOVE breakout box. RECONNECT processor and ACT sensor. RERUN Quick Test.

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Air Charge Temperature Sensor (ACT) — Pinpoint Test DB

TEST STEP		RESULT ▶	ACTION TO TAKE
DB20	SERVICE CODE 64: ATTEMPT TO GENERATE CODE 54		
	Service Code 64 indicates that the Air Charge Temperature Sensor (ACT) signal is less than the Self-Test minimum value of 0.2 volts (circuit grounded). Possible causes are: — Faulty ACT sensor — Grounded harness — Faulty processor ∘ Key off, wait 10 seconds. ∘ Disconnect vehicle harness from ACT sensor. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. ∘ Run Key On Engine Off Self-Test. ∘ **Is Code 54 present?**	Yes ▶ No ▶	REPLACE ACT sensor. RECONNECT ACT sensor. RERUN Quick Test. GO to DB21.
DB21	CHECK FOR VREF AT THROTTLE POSITION SENSOR		
	∘ Refer to schematic in Pinpoint Test DH. ∘ Key off, wait 10 seconds. ∘ DVOM on 20 volt scale. ∘ Disconnect TP sensor. ∘ Key on, engine off. ∘ Measure voltage at the TP vehicle harness connector between VREF and SIGNAL RETURN. ∘ **Is voltage between 4.0 and 6.0 volts?**	Yes ▶ No ▶	RECONNECT TP sensor, GO to DB22. GO to Pinpoint Test Step C1.
DB22	CHECK ACT SIGNAL FOR SHORT TO GROUND		
	∘ Key off, wait 10 seconds. ∘ Harness disconnected from ACT sensor. ∘ Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. ∘ Install breakout box, leave processor disconnected. ∘ DVOM on 200,000 ohm scale. ∘ Measure resistance between Test Pin 25 and Test Pins 40, 46 and 60 at the breakout box. ∘ **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT processor and ACT sensor. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT processor and ACT sensor. RERUN Quick Test.

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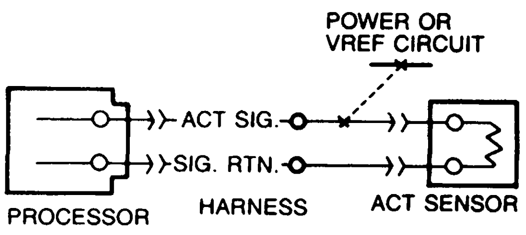
Air Charge Temperature Sensor (ACT) | Pinpoint Test | DB

TEST STEP	RESULT ▶	ACTION TO TAKE
DB90 CONTINUOUS MEMORY CODE 54: CHECK ACT SENSOR		
Continuous Memory Code 54 indicates that the Air Charge Temperature Sensor (ACT) signal went greater than the Self-Test maximum value of 4.6 volts sometime during vehicle operation. Possible causes are: — Faulty ACT sensor — Open harness — Faulty processor • Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: — Lightly tap on ACT sensor (simulate road shock). — Wiggle ACT connector. • **Is a fault indicated?**  A9582-B	Yes ▶ No ▶	DISCONNECT and INSPECT connectors. If connector and terminals are good, REPLACE ACT sensor. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test. GO to DB91 .
DB91 CHECK EEC-IV HARNESS		
• Still in Key On Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: — Referring to the illustration in Step DB90 , grasp the harness closest to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV harness from the dash panel to the processor. • **Is a fault indicated?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test. GO to DB92 .

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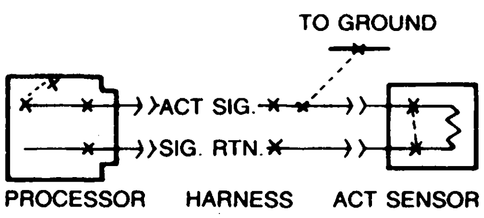
Air Charge Temperature Sensor (ACT) — Pinpoint Test DB

TEST STEP	RESULT ▶	ACTION TO TAKE
DB92 CHECK PROCESSOR AND HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. • Inspect both connectors and connector terminals for obvious damage or faults. • **Are connectors and terminals OK?**	No ▶	SERVICE as necessary. CLEAR Continuous Memory Code 54. REFER to Quick Test Appendix. RERUN Quick Test.
	Yes ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.
DB93 CONTINUOUS MEMORY CODE 64: CHECK ACT SENSOR		
Continuous Memory Code 64 indicates that the Air Charge Temperature Sensor (ACT) signal went less than the Self-Test minimum value of 0.2 volts sometime during vehicle operation. Possible causes are: — Faulty ACT sensor — Open harness — Faulty processor • Enter Key On Engine Off Continuous Monitor mode. Refer to the Quick Test Appendix. • Observe VOM or STAR LED for an indication of a fault while performing the following: — Lightly tap on ACT sensor (simulate road shock). — Wiggle ACT connector. • **Is a fault indicated?**	Yes ▶	DISCONNECT and INSPECT connectors. If connector and terminals are good, REPLACE ACT sensor. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.
	No ▶	GO to $\boxed{DB94}$.



A9467-A

* Can be purchased as a separate item.

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Air Charge Temperature Sensor (ACT) — Pinpoint Test DB

TEST STEP	RESULT ▶	ACTION TO TAKE
DB94 CHECK EEC-IV HARNESS		
• Still in Key On Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: — Referring to the illustration in Step DB93, grasp the harness closest to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV harness from the dash panel to the processor. • **Is a fault indicated?**	Yes ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.
	No ▶	GO to DB95.
DB95 CHECK PROCESSOR AND HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. • Inspect both connectors and connector terminals for obvious damage or faults. • **Are connectors and terminals OK?**	No ▶	SERVICE as necessary. CLEAR Continuous Memory Code 64. REFER to Quick Test Appendix. RERUN Quick Test.
	Yes ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.

* Can be purchased as a separate item.

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Mass Airflow Sensor (MAF)

Pinpoint Test

DC

Note

You should enter this Pinpoint Test only when a Service Code 26, 56, or 66 is received in Quick Test Step 3.0, 5.0, or 6.0 or when directed here from Quick Test Step 7.0.

Remember

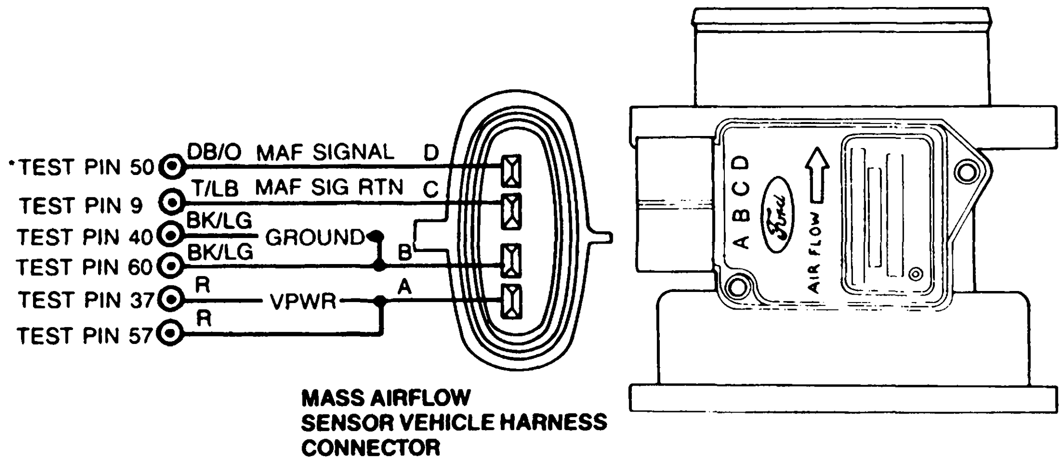
To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Air cleaner element
- Inlet air duct
- Throttle body

This Pinpoint Test is intended to diagnose only the following:

- Mass Airflow sensor (-12B579-)
- Harness circuits: VPWR, POWER GROUND, MAF SIGNAL, and MAF RTN
- Processor assembly (-12A650-)

Pinpoint Test Schematic



***TEST PINS LOCATED ON THE BREAKOUT BOX.**
NOTE: ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A11544-B

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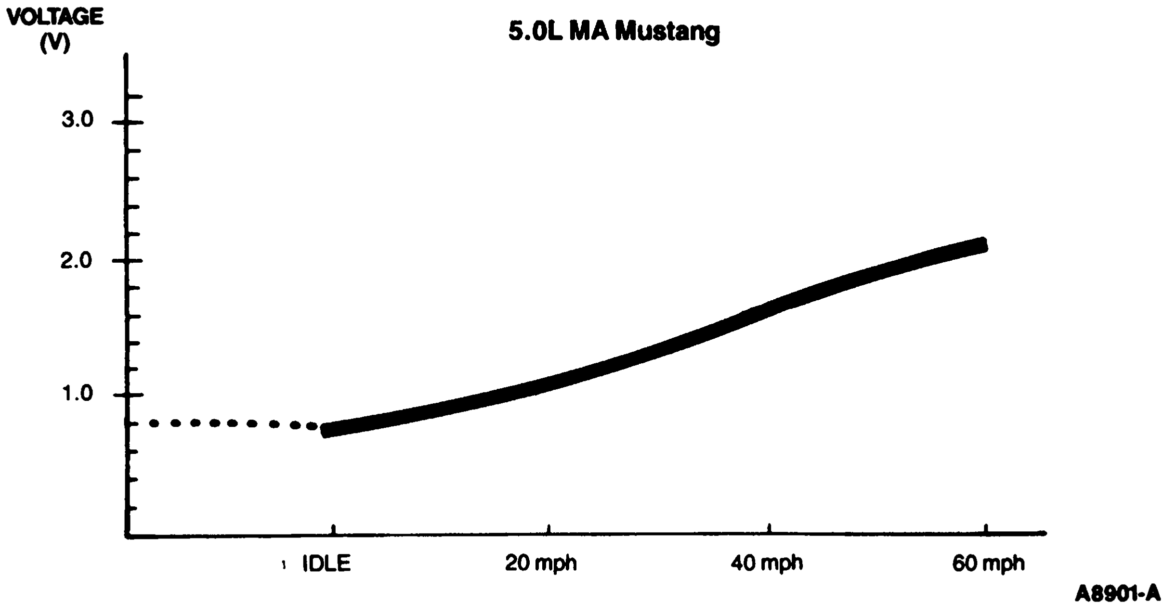
Mass Airflow Sensor (MAF)

Pinpoint Test **DC**

NOTE: MAF signal voltage vs. engine state while engine is at normal operating temperature. These values are typical for automatics, but may vary based on vehicle load and temperature.

MAF Sensor Graph



MAF Sensor Data

Engine Condition	MAF Signal Voltage
IDLE	.80
20 mph	1.10
40 mph	1.70
60 mph	2.10

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Mass Airflow Sensor (MAF) — Pinpoint Test DC

TEST STEP		RESULT ▶	ACTION TO TAKE
DC1	ENGINE RUNNING CODE 26: OUT-OF-RANGE FAILURE		
	• Engine Running Service Code 26 indicates MAF sensor voltage is not in range (≈ .20-1.50 volts DC) and a KOEO, or Continuous Memory Service Code(s) is present. • Service as usual the KOEO hard fault **FIRST,** then any MAF Continuous Memory Service Codes (56, 66) displayed.	▶	For Service Code 26: GO to DC2. For Service Code 56: GO to DC10. For Service Code 66: GO to DC4.
DC2	ENGINE RUNNING SERVICE CODE 26: CHECK VOLTAGE OF VPWR CIRCUIT		
	Service Code 26 indicates that the Mass Air Flow (MAF) sensor is out of Self-Test range. Correct range of measurement is .20 to 1.50 volts for KOER or typically lower than .70 volts for KOEO. The MAF sensor voltage can be affected by the garage exhaust ventilation system and **COULD** generate a Service Code 26. Remove ventilation system and properly vent to outside atmosphere before rerunning Self-Test. Possible causes: — Faulty vane meter — Faulty processor • Key off. • Disconnect MAF sensor from vehicle harness. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between VPWR circuit at the MAF sensor vehicle harness connector and battery negative post. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to DC3. GO to Pinpoint Test Step B1.

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Mass Airflow Sensor (MAF) — Pinpoint Test — DC

TEST STEP	RESULT ▶	ACTION TO TAKE
DC3 CHECK MAF SENSOR GROUND		
• Key on, engine off. • MAF sensor disconnected. • DVOM on 20 volt scale. • Measure voltage between VPWR circuit and PWR GND circuit at the MAF sensor vehicle harness connector. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to DC4 . RECONNECT MAF sensor. SERVICE open PWR GND circuit. RERUN Quick Test.
DC4 SERVICE CODE 66: CHECK CONTINUITY OF MAF SIGNAL AND VPWR CIRCUITS		
Service Code 66 indicates that the Mass Air Flow (MAF) sensor signal went below .40 volts during normal engine operation (continuous) or during Self-Test. Possible causes: — Open MAF signal circuit — Open VPWR circuit to MAF — Open PWR GND circuit to MAF — Open MAF SIG RTN circuit to MAF — MAF Signal shorted to ground — Faulty Processor — Faulty MAF sensor — Air leak before or after MAF sensor — MAF sensor disconnected • Key off. • MAF sensor disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between MAF SIGNAL at the MAF sensor vehicle harness connector and Test Pin 50 at the breakout box. • Measure resistance between VPWR at the MAF sensor vehicle harness connector and Test Pins 37/57 at the breakout box. • **Are both resistances less than 5 ohms?**	Yes ▶ No ▶	GO to DC5 . REMOVE breakout box. RECONNECT all components. SERVICE open circuit. RERUN Quick Test.

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Mass Airflow Sensor (MAF) | Pinpoint Test | DC

TEST STEP		RESULT ▶	ACTION TO TAKE
DC5	CHECK MAF SIGNAL FOR SHORTS TO GROUND AND MAF SIG RTN		
	• Key off. • Breakout box installed, processor disconnected. • MAF sensor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 50 and Test Pins 40, 9, and 60 at the breakout box. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to DC6 . REMOVE breakout box. RECONNECT all components. SERVICE short circuit(s). RERUN Quick Test.
DC6	CHECK CONTINUITY OF PWR GND CIRCUIT		
	• Key off. • MAF sensor disconnected. • DVOM on 200 ohm scale. • Measure resistance between PWR GND circuit at the MAF sensor vehicle harness connector and battery negative post. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to DC7 . SERVICE open circuit. RECONNECT MAF sensor. RERUN Quick Test.
DC7	CHECK CONTINUITY OF MAF SIG RTN CIRCUIT		
	• Key off. • MAF sensor disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between MAF SIG RTN circuit at the MAF sensor vehicle harness connector and Test Pin 9 at the breakout box. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to DC8 . REMOVE breakout box. RECONNECT all components. SERVICE open circuit. RERUN Quick Test.

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Mass Airflow Sensor (MAF) | Pinpoint Test | DC

TEST STEP		RESULT ▶	ACTION TO TAKE
DC8	CHECK MAF SIGNAL FOR SHORT TO GROUND		
	• Key off. • Breakout box installed. • Connect processor to breakout box. • MAF sensor disconnected. • DVOM on 20,000 ohm scale. • Measure resistance between Test Pin 50 and Test Pin 40/60 and 9 at the breakout box. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	Go to DC9 . REPLACE processor. RECONNECT MAF sensor.
DC9	CHECK MAF OUTPUT		
	• Key off. • Breakout box installed, processor connected. • MAF sensor connected. • DVOM on 20 volt scale. • Measure voltage between Test Pin 50 and battery negative post. • Key on, engine running. • **Is voltage between .20 and 1.50 volts?**	Yes ▶ No ▶	REPLACE processor. REPLACE MAF sensor.
DC10	SERVICE CODE 56: RERUN SELF-TEST WITH MAF SENSOR DISCONNECTED		
	• Key off. • Disconnect MAF sensor from vehicle harness. • Start engine, idle one minute. • Key off. • Rerun Key On Engine Off Self-Test. • **Is Service Code 66 present?**	Yes ▶ No ▶	REPLACE MAF sensor. RERUN Quick Test. GO to DC11 .
DC11	CHECK MAF SIGNAL FOR SHORT TO VPWR		
	• Key off. • MAF sensor disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between MAF SIGNAL and VPWR at the MAF sensor vehicle harness connector. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT MAF sensor. REPLACE processor. RERUN Quick Test. REMOVE breakout box. RECONNECT all components. SERVICE short circuit. RERUN Quick Test.

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EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV)

Pinpoint Test

DD

Note

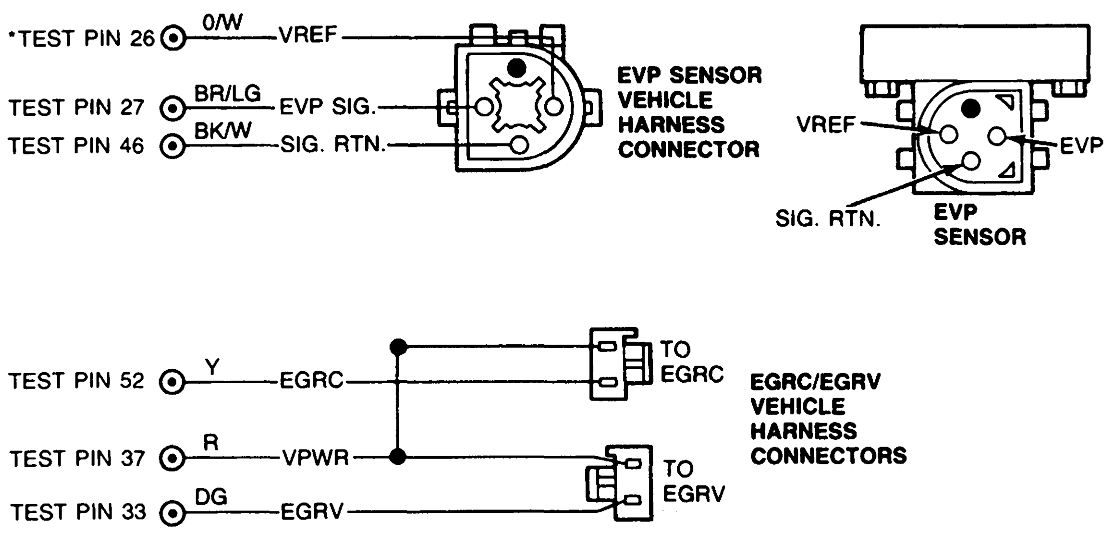
You should enter this Pinpoint Test only when a Service Code 31, 32, 33, 34, 35, 83 or 84 is received in Quick Test Step 3.0, 5.0, or 6.0.

Remember

This Pinpoint Test is intended to diagnose only the following:

- EVP sensor (-9G428-)
- Harness circuits: EVP, SIGNAL RETURN, VREF, EGRV, EGRC, VPWR
- EGRV/EGRC solenoids (-9D474-)
- EGR Valve (-9H473-)
- Processor assembly (-12A650-)
- Vacuum lines (EGRV/EGRC, EGR)

Pinpoint Test Schematic



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9583-C

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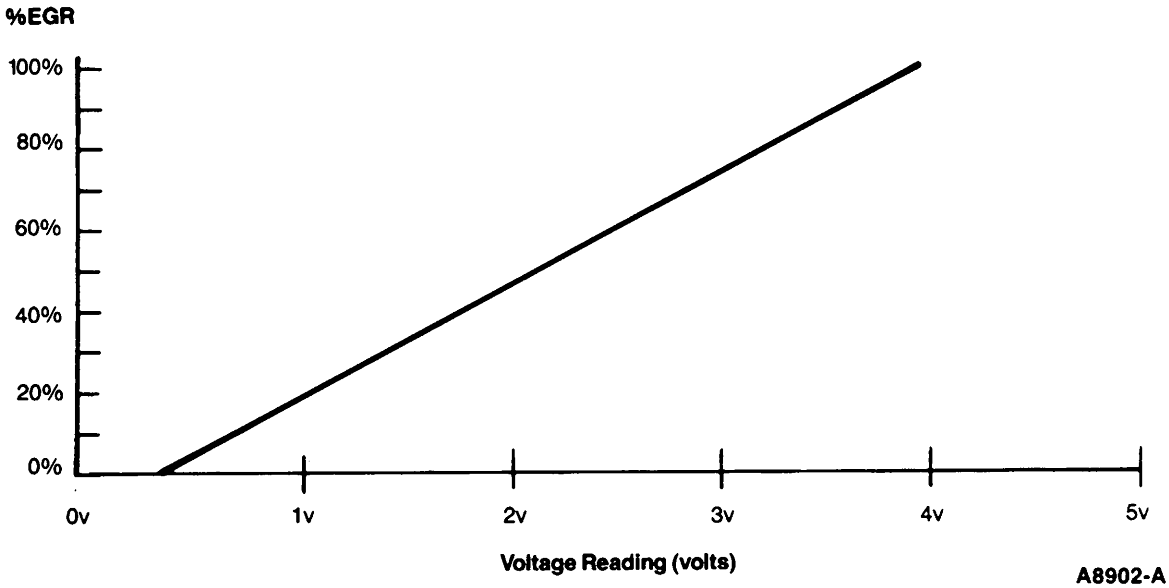
EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV)

Pinpoint Test DD

NOTE: Voltage values calculated for VREF = 5.0 volts (These values may vary ±15 percent due to sensor and VREF variations.)

EVP Sensor Graph



A8902-A

EVP Sensor Data

% EGR	VOLTAGE
0	0.40
10	0.75
20	1.10
30	1.45
40	1.80
50	2.15
60	2.50
70	2.85
80	3.20
90	3.55
100	3.90

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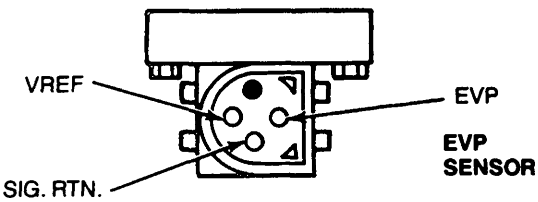
EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV) — Pinpoint Test DD

TEST STEP		RESULT ▶	ACTION TO TAKE
DD1	ENGINE RUNNING SERVICE CODE 31: RUN ENGINE RUNNING SELF-TEST WITH EGR VACUUM SIGNAL LINE DISCONNECTED AT EGR VALVE		
	Engine Running Service Code 31 indicates that during the Engine Running Self-Test, the EVP sensor signal to the processor is not in the expected range with the EGR valve closed. Possible causes are: — Faulty EGRC/EGRV solenoids — Clogged EGRV filter o Key off, wait 10 seconds. o Disconnect EGR vacuum line at EGR valve and cap EGR vacuum line. o Rerun Engine Running Self-Test. o **Is Code 31 present?** **NOTE: Ignore all other codes at this time.**	Yes ▶ No ▶	GO to DD2. RECONNECT vacuum line. GO to DD11.
DD2	KEY ON ENGINE OFF SERVICE CODE 31: CHECK EVP RESISTANCE WHILE APPLYING VACUUM TO EGR VALVE		
	Key On Engine Off Service Code 31 indicates that the EVP sensor signal to the processor is not in the expected range with the EGR valve closed. Possible causes are: — Open or shorted circuit — Faulty EGR valve — Faulty EVP sensor — Faulty processor o Key off, wait 10 seconds. o Disconnect EGR vacuum line at EGR valve and cap the vacuum line. o Disconnect vehicle harness at EVP sensor. o DVOM on 200,000 ohm scale. o Connect vacuum pump to EGR valve. o Measure resistance at the EVP sensor between EVP SIG and VREF while gradually increasing vacuum to 33 kPa (10 in-Hg). o Observe resistance as vacuum increases.  A8903-A	Reading gradually decreases from no greater than 5500 ohms to no less than 100 ohms ▶ Reading is less than 100 ohms or greater than 5500 ohms ▶ Reading does not decrease or unable to hold vacuum ▶	RECONNECT vacuum line. GO to DD3. REPLACE EVP sensor. RECONNECT signal line and harness. RERUN Quick Test. GO to DD14.

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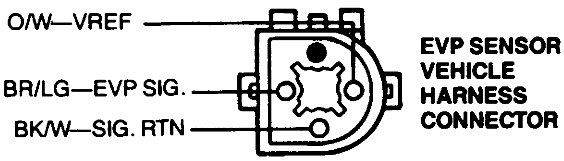
EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV)

Pinpoint Test | **DD**

TEST STEP	RESULT ▶	ACTION TO TAKE
DD3 CHECK FOR VREF AT THE EVP SENSOR		
• Key on, engine off. • Harness disconnected from EVP sensor. • DVOM on 20 volt scale. • Measure voltage at the EVP vehicle harness connector between VREF and SIGNAL RETURN. • **Is voltage between 4.0 and 6.0 volts?**	Yes ▶ No ▶	GO to DD4. GO to Pinpoint Test Step C1.
 A8904-A		
DD4 CHECK CONTINUITY OF EVP SIGNAL CIRCUIT		
• Key off, wait 10 seconds. • Harness disconnected from EVP sensor. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 27 at the breakout box and EVP SIGNAL at the EVP vehicle harness connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to DD5. SERVICE open circuit. REMOVE breakout box. RECONNECT processor and EVP sensor. RERUN Quick Test.

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EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV)

Pinpoint Test DD

TEST STEP	RESULT ▶	ACTION TO TAKE
DD5 CHECK EVP SIGNAL FOR SHORTS TO VREF AND SIGNAL RETURN		
• Key off. • Harness disconnected from EVP sensor. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 27 and Test Pins 26, 40, 46 and 60 at breakout box. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to DD6. SERVICE short circuit. REMOVE breakout box. RECONNECT processor and EVP sensor. RERUN Quick Test.
DD6 SUBSTITUTE EVP SENSOR AND EGR VALVE		
• Key off, wait 10 seconds. • Electrically connect known good EVP sensor and EGR valve assembly. • Connect processor to breakout box. • Perform Key On Engine Off Self-Test. • **Is Code 31 present?**	Yes ▶ No ▶	REMOVE breakout box. REPLACE processor. CONNECT original EVP sensor and EGR valve assembly. RERUN Quick Test. GO to DD7.
DD7 CHECK EVP SENSOR		
• Key off, wait 10 seconds. • Breakout box installed, processor connected. • Install original EVP sensor on known good EGR valve. • Connect harness to EVP sensor. • Rerun Key On Engine Off Self-Test. • **Is Code 31 present?**	Yes ▶ No ▶	INSTALL new EVP sensor. REMOVE breakout box. RECONNECT processor. RERUN Quick Test. REMOVE breakout box. RECONNECT processor. REFER to EGR System, Section 6.

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EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV) — Pinpoint Test DD

TEST STEP	RESULT ▶	ACTION TO TAKE
DD11 SERVICE CODES 32/33/34: CHECK FOR VACUUM CYCLING AT EGR VALVE		
Engine Running Service Codes 32/33/34 indicate that when instructed by the processor, the EGR system was unable to either open the EGR valve (34), hold the valve open (32), or close the valve properly (33). Possible causes are: — Faulty vacuum lines — Clogged EGRV filter — Faulty EVP sensor — Faulty EGR valve — Faulty EGRC/EGRV solenoids — Faulty processor • Key off. • Disconnect vacuum line at the EGR valve. • Connect a vacuum gauge to the vacuum line, leaving the EGR valve disconnected. • While observing vacuum gauge, rerun Engine Running Self-Test. • **During test, does vacuum reading;** — **Increase from less than 1 in-Hg to greater than 5 in-Hg?** — **And, within 10 seconds, return to less than 1 in-Hg?** **NOTE: Disregard code output at this time.**	Yes ▶ No ▶ Vacuum did not increase. No ▶ Vacuum did increase, but did not return to less than 1 in-Hg within 10 seconds.	REMOVE vacuum gauge. GO to DD13 . REMOVE vacuum gauge. GO to DD12 . CHECK EGRV filter for obstructions. REPLACE as necessary. If OK, REPLACE solenoid assembly. RECONNECT all vacuum lines. RERUN Quick Test.
DD12 VERIFY VACUUM SUPPLY TO EGRC/EGRV SOLENOIDS		
• Key off. • Disconnect the vacuum source to the EGRC/ EGRV solenoids. • Install a vacuum gauge at source vacuum line. • Start engine and check vacuum. • **Is vacuum greater than 33 kPa (10 in-Hg)?**	Yes ▶ No ▶	CHECK vacuum line from EGRC/EGRV solenoids to EGR valve for kinks, obstructions or leaks. If OK, REPLACE solenoid assembly. RECONNECT all vacuum lines. RERUN Quick Test. CHECK source vacuum line to EGRC/EGRV solenoids. SERVICE as necessary. RECONNECT all vacuum lines. RERUN Quick Test.

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EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV) — Pinpoint Test DD

TEST STEP	RESULT ▶	ACTION TO TAKE
DD13 CHECK EVP RESISTANCE WHILE APPLYING VACUUM TO EGR VALVE		
o Key off. o Disconnect vehicle harness from EVP sensor. Inspect for damaged pins, corrosion, and pins pushed out. Service as necessary. o DVOM on 200,000 ohm scale. o Disconnect vacuum line at EGR valve. o Connect vacuum pump to EGR valve. o Measure resistance between EVP SIGNAL and VREF at the EVP sensor connector while increasing vacuum to 33 kPa (10 in-Hg). o Observe resistance as vacuum increases. o **Does the resistance gradually change between 5500 and 100 ohms?**	Yes ▶	REPLACE processor. RECONNECT EVP sensor and EGR vacuum line. RERUN Quick Test.
	No ▶	GO to DD14 .
DD14 MANUALLY EXERCISE EVP SENSOR		
o Key off. o Harness disconnected from EVP sensor. o Remove EVP sensor from EGR valve. o Measure resistance between EVP SIGNAL and VREF at the EVP sensor connector while gradually applying pressure to EVP sensor shaft. o Observe resistance as shaft is slowly pushed in and slowly released. o **Does the resistance change gradually between 5500 and 100 ohms?** **NOTE: It is normal for the EVP sensor total resistance to drop below 100 ohms when disconnected from the EGR valve. A defective part will change resistance suddenly between 5500 and 100 ohms.**	Yes ▶	REFER to EGR System, Section 6. RECONNECT EVP sensor and EGR supply vacuum line.
	No ▶	REPLACE EVP sensor. RECONNECT harness and EGR supply vacuum line. RERUN Quick Test.

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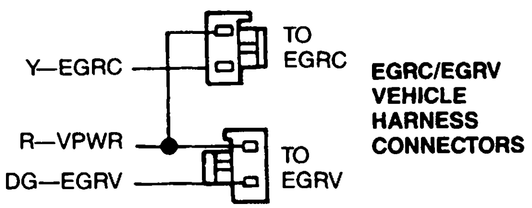
EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV)

Pinpoint Test **DD**

TEST STEP	RESULT ▶	ACTION TO TAKE
DD17 SERVICE CODE 83/84: CHECK EGRV/EGRC SOLENOID RESISTANCE		
Service Code 83 indicates an EGRC circuit failure. Service Code 84 indicates an EGRV circuit failure. Possible causes are: — Open or shorted circuit — Faulty EGRC/EGRV solenoid — Faulty processor • Key off, wait 10 seconds. • DVOM on 200 ohm scale. • Disconnect EGRV solenoid connector and measure solenoid resistance. Inspect for damaged pins, corrosion and pins pushed out. Service as necessary. • Disconnect EGRC solenoid connector and measure solenoid resistance. Inspect for damaged pins, corrosion and pins pushed out. Service as necessary. • **Are both resistances between 30 and 70 ohms?**	Yes ▶ No ▶	GO to DD18 . REPLACE EGRC/EGRV solenoid assembly. RERUN Quick Test.
DD18 CHECK FOR VPWR at EGRC/EGRV SOLENOIDS		
• Disconnect harness from EGRC/EGRV solenoids. • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between battery negative post and VPWR circuit on both EGR solenoid vehicle harness connectors. • **Are both voltages greater than 10.5 volts?**  A8905-A	Yes ▶ No ▶	GO to DD19 . SERVICE open circuit. RECONNECT EGRC/ EGRV solenoids. RERUN Quick Test.

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EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV)

Pinpoint Test DD

TEST STEP		RESULT ▶	ACTION TO TAKE
DD19	CHECK CONTINUITY OF EGRC/EGRV CIRCUITS		
	• Key off, wait 10 seconds. • EGRC/EGRV solenoids disconnected from harness. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 33 at the breakout box and EGRV circuit at the EGRV solenoid vehicle harness connector. • Measure resistance between Test Pin 52 at the breakout box and EGRC circuit at the EGRC solenoid vehicle harness connector. • **Are both resistances less than 5 ohms?**	Yes ▶ No ▶	GO to DD20. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
DD20	CHECK EGRC/EGRV CIRCUITS FOR SHORT TO GROUND		
	• Key off, wait 10 seconds. • DVOM on 200,000 ohm scale. • Breakout box installed, processor disconnected. • EGRC/EGRV solenoids disconnected. • Measure resistance between Test Pins 33 and Test Pins 40, 46 and 60 at the breakout box. • Measure resistance between Test Pin 52 and Test Pins 40, 46, and 60 at the breakout box. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to DD21. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV) — Pinpoint Test DD

TEST STEP	RESULT ▶	ACTION TO TAKE
DD21 CHECK EGRC/EGRV CIRCUITS FOR SHORTS TO POWER		
• Key off. • Breakout box installed, processor disconnected. • EGRC/EGRV solenoids disconnected from harness. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 33 and Test Pins 37 and 57 at the breakout box. • Measure resistance between Test Pin 52 and Test Pins 37 and 57 at the breakout box. • **Are all resistances greater than 10,000 ohms?**	Yes ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
	No ▶	SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. If code is repeated, REPLACE processor.
DD30 SERVICE CODE 35: CHECK FOR CODE 12		
Service Code 35 indicates that the engine rpm was too low to perform the EGR test. Possible causes are: — Faulty ISC system — Faulty processor • **Is Code 12 also present?**	Yes ▶	GO to KE1 .
	No ▶	GO to DD31 .
DD31 RETEST AT 1,500 RPM		
• Key off, wait 10 seconds. • Install tachometer. • Rerun Engine Running Self-Test while maintaining 1,500 rpm. • **Is Code 35 still present?** **NOTE: Ignore all other codes at this time.**	Yes ▶	REPLACE processor. RERUN Quick Test.
	No ▶	RERUN Quick Test. SERVICE any other codes as necessary.

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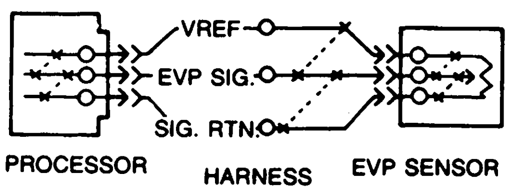
EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV)

Pinpoint Test DD

TEST STEP	RESULT ▶	ACTION TO TAKE
DD90 CONTINUOUS MEMORY CODE 31: EXERCISE EVP SENSOR		
Continuous Memory Code 31 indicates that sometime during vehicle operation, the EVP signal was out of Self-Test range. Possible causes are: — Open or shorted circuit — Faulty EVP sensor • Enter Key On Engine Off continuous monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: • Connect a vacuum pump to the EGR valve. • Very slowly apply 20 kPa (6 in-Hg) vacuum to the EGR valve. • Slowly bleed vacuum off the EGR valve. Lightly tap on EVP sensor (simulate road shock). • Wiggle EVP sensor connector. • **Is a fault indicated?**  A9584-B	Yes ▶ No ▶	GO to DD91. GO to DD92.
DD91 MEASURE EVP SIGNAL VOLTAGE WHILE EXERCISING EVP SENSOR		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • Connect a DVOM between Test Pin 27 and Test Pin 46. • DVOM on 20 volt scale. • Re-enter Key On Engine Off continuous monitor mode. • While observing DVOM, repeat Test Step DD90. • **Does the fault occur below 4.25 volts?**	Yes ▶ No ▶	DISCONNECT and INSPECT connector. If connector and terminals are good, REPLACE EVP sensor. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test. EGR valve overshoot may have caused Continuous Memory Code 31. Sensor service is not required. To verify harness integrity, GO to DD92.

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EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV) — Pinpoint Test DD

TEST STEP	RESULT ▶	ACTION TO TAKE
DD92 CHECK EEC-IV HARNESS		
• Observe VOM or STAR LED for a fault indication while performing the following: • Referring to the illustration in Step DD90, grasp the harness closest to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV harness from the dash panel to the processor. • **Is a fault indicated?**	Yes ▶	ISOLATE fault and SERVICE as necessary. REFER to appropriate figure. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.
	No ▶	GO to DD93.
DD93 CHECK PROCESSOR AND HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. • Inspect both connectors and connector terminals for obvious damage or faults. • **Are connectors and terminals OK?**	Yes ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.
	No ▶	SERVICE as necessary. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.

* Can be purchased as a separate item.

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Engine Coolant Temperature Sensor (ECT) | Pinpoint Test | DE

Note

You should enter this Pinpoint Test only when a Service Code 21, 51 or 61 is received in Quick Test Step 3.0, 5.0 or 6.0.

Remember

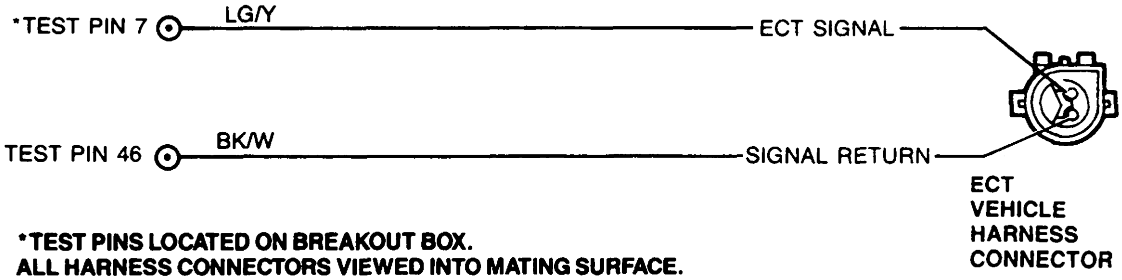
To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Coolant level
- Oil level
- Blocked or obstructed airflow
- Engine not at normal operating temperature
- Water pump drive belt
- Electro drive cooling fan
- Open thermostat

This Pinpoint Test is intended to diagnose only the following:

- ECT sensor (-12A648-)
- Harness sensor circuits: ECT and SIGNAL RETURN
- Processor assembly (-12A650-)

Pinpoint Test Schematic



***TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9585-C

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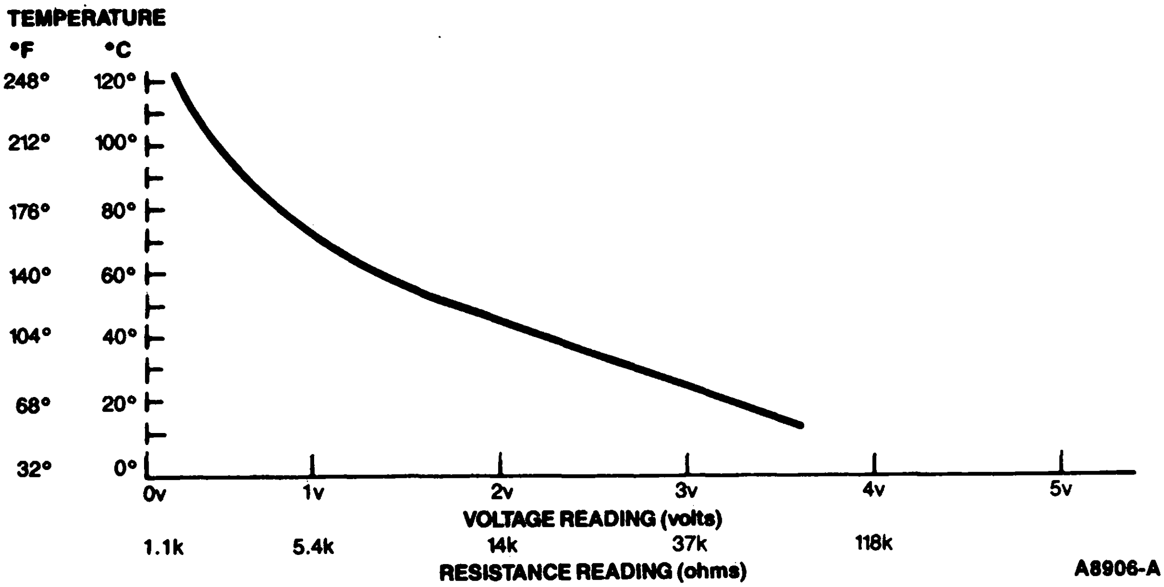
Engine Coolant Temperature Sensor (ECT)

Pinpoint Test DE

NOTE: To pass this test, engine coolant temperature must be: Key On, Engine Off (50°F to 240°F), Engine Running (180°F to 240°F). Voltage values calculated for VREF = 5.0 volts (These values may vary ± 15 percent due to sensor and VREF variations).

ECT Sensor Graph



ECT Sensor Data

Temperature		Voltage	Resistance
°F	°C	Volts	K ohms
248	120	.27	1.18
230	110	.35	1.55
212	100	.46	2.07
194	90	.60	2.80
176	80	.78	3.84
158	70	1.02	5.37
140	60	1.33	7.70
122	50	1.70	10.97
104	40	2.13	16.15
86	30	2.60	24.27
68	20	3.07	37.30
50	10	3.51	58.75

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Engine Coolant Temperature Sensor (ECT) | Pinpoint Test | DE

TEST STEP		RESULT ▶	ACTION TO TAKE
DE1	SERVICE CODE 21: CHECK ENGINE OPERATING TEMPERATURE		
Service Code 21 indicates that the Engine Coolant Temperature Sensor (ECT) is out of Self-Test range. Correct range of measurement is 0.3 to 3.5 volts. Possible causes are: — ECT resistance is out of limits — Faulty processor o For no starts: GO to DE4. o Run engine for 2 minutes at 2,000 rpm. o Check that upper radiator hose is hot and pressurized. o Rerun Quick Test. o **Is Code 21 present?**		Vehicle stalls ▶ Yes ▶ No ▶	Do not service Code 21 at this time. GO to S1. GO to DE2. SERVICE other codes as necessary.
DE2	CHECK FOR VREF AT THROTTLE POSITION SENSOR		
o Refer to schematic in Pinpoint Test DH. o Key off, wait 10 seconds. o DVOM on 20 volt scale. o Disconnect TP sensor. o Key on, engine off. o Measure voltage between VREF and SIGNAL RETURN at the TP vehicle harness connector. o **Is voltage between 4.0 and 6.0 volts?**		Yes ▶ No ▶	RECONNECT TP sensor, GO to DE3. GO to Pinpoint Test Step C1.

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Engine Coolant Temperature Sensor (ECT) — Pinpoint Test DE

TEST STEP	RESULT ▶	ACTION TO TAKE
DE3 CHECK RESISTANCE OF ECT SENSOR		
NOTE: Engine may have cooled down. Always warm engine before taking ECT resistance measurement. Check for open thermostat. • Key off, wait 10 seconds. • Disconnect harness from ECT sensor. • DVOM on 200,000 ohm scale. • Measure resistance of the ECT sensor. — Engine off: 1300 ohms (240°F) to 7700 ohms (140°F) — Engine running: 1550 ohms (230°F) to 4550 ohms (170°F). • **Are both resistances within specification?**	Yes ▶ No ▶	REPLACE processor. RECONNECT harness to ECT sensor. RERUN Quick Test. REPLACE ECT sensor. RECONNECT harness to ECT sensor. RERUN Quick Test.
DE4 CHECK RESISTANCE OF ECT SENSOR WITH A NO START CONDITION		
• Key off. • Disconnect harness from ECT sensor. • DVOM on 200,000 ohm scale. • Measure resistance of the ECT sensor. • Refer to ECT Sensor Graph and Data Chart at beginning of Pinpoint Test DE. • **Is resistance within chart specifications?**	Yes ▶ No ▶	Do not service Code 21 at this time. GO to $\boxed{A1}$. RECONNECT harness to ECT sensor. Replace ECT sensor. RECONNECT harness to ECT sensor. RERUN Quick Test.

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Engine Coolant Temperature Sensor (ECT)

Pinpoint Test DE

TEST STEP	RESULT ▶	ACTION TO TAKE
DE10 SERVICE CODE 51: ATTEMPT TO GENERATE CODE 61		
Service Code 51 indicates that the Engine Coolant Temperature Sensor (ECT) signal is greater than the Self-Test maximum value of 4.6 volts (circuit open). Possible causes are: — Faulty ECT sensor — Open harness — Faulty processor • Key off, wait 10 seconds. • Disconnect vehicle harness from ECT sensor. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Insert a jumper wire at the ECT sensor vehicle harness connector between ECT SIGNAL and SIGNAL RETURN. • Run Key On Engine Off Self-Test. • **Is Code 61 present?**	Yes ▶ No ▶	REPLACE ECT sensor. REMOVE jumper wire. RECONNECT ECT sensor. RERUN Quick Test. REMOVE jumper wire. GO to DE11 .
DE11 CHECK CONTINUITY OF ECT SIGNAL AND SIGNAL RETURN		
• Key off, wait 10 seconds. • Harness disconnected from ECT sensor. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between ECT SIGNAL at the ECT vehicle harness connector and Test Pin 7 at the breakout box. • Measure resistance between SIGNAL RETURN at the ECT sensor vehicle harness connector, and Test Pin 46 at the breakout box. • **Are both resistances less than 5 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT processor and ECT sensor. RERUN Quick Test. SERVICE open circuit(s). REMOVE breakout box. RECONNECT processor and ECT sensor. RERUN Quick Test.

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Engine Coolant Temperature Sensor (ECT) | Pinpoint Test | DE

TEST STEP	RESULT ▶	ACTION TO TAKE
DE20 SERVICE CODE 61: ATTEMPT TO GENERATE CODE 51		
Service Code 61 indicates that the Engine Coolant Temperature Sensor (ECT) signal is less than the Self-Test minimum value of 0.2 volts (circuit grounded). Possible causes are: — Faulty ECT sensor — Grounded harness — Faulty processor • Key off, wait 10 seconds. • Disconnect vehicle harness from ECT sensor. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Run Key On Engine Off Self-Test. • **Is Code 51 present?**	Yes ▶ No ▶	REPLACE ECT sensor. RECONNECT ECT sensor. RERUN Quick Test. GO to DE21 .
DE21 CHECK FOR VREF AT THROTTLE POSITION SENSOR		
• Refer to schematic in Pinpoint Test DH. • Key off, wait 10 seconds. • DVOM on 20 volt scale. • Disconnect TP sensor. • Key on, engine off. • Measure voltage between VREF and SIGNAL RETURN at the TP vehicle harness connector. • **Is voltage between 4.0 and 6.0 volts?**	Yes ▶ No ▶	RECONNECT TP sensor, GO to DE22 . GO to Pinpoint Test Step C1 .
DE22 CHECK ECT SIGNAL FOR SHORT TO GROUND		
• Key off, wait 10 seconds. • Harness disconnected from ECT sensor. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 7 and Test Pins 40, 46 and 60 at the breakout box. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT processor and ECT harness. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT processor and ECT sensor. RERUN Quick Test.

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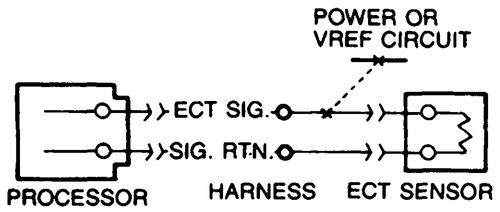
Engine Coolant Temperature Sensor (ECT) — Pinpoint Test DE

TEST STEP	RESULT ▶	ACTION TO TAKE
DE90 CONTINUOUS MEMORY CODE 51: CHECK ECT SENSOR		
Continuous Memory Code 51 indicates that the Engine Coolant Temperature Sensor (ECT) signal went greater than the Self-Test maximum value of 4.6 volts sometime during vehicle operation. Possible causes are: — Faulty ECT sensor — Open harness — Faulty processor • Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: — Lightly tap on ECT sensor (simulate road shock). — Wiggle ECT connector. • **Is a fault indicated?**  A9586-B	Yes ▶	DISCONNECT and INSPECT connectors. If connector and terminals are good, REPLACE ECT sensor. CLEAR Continuous Memory. Refer to Quick Test Appendix. RERUN Quick Test.
	No ▶	GO to DE91 .
DE91 CHECK EEC-IV HARNESS		
• Still in Key On Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: — Referring to the illustration in Step DE90 , grasp the harness closest to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV harness from the dash panel to the processor. • **Is a fault indicated?**	Yes ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory. Refer to Quick Test Appendix. RERUN Quick Test.
	No ▶	GO to DE92 .

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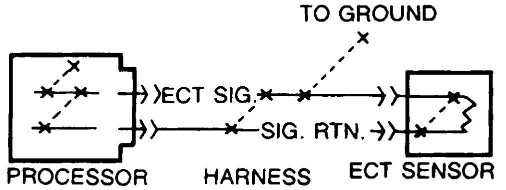
Engine Coolant Temperature Sensor (ECT)

Pinpoint Test DE

TEST STEP		RESULT ▶	ACTION TO TAKE
DE92	CHECK PROCESSOR AND HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. • Inspect both connectors and connector terminals for obvious damage or faults. • **Are connectors and terminals OK?**		No ▶	SERVICE as necessary. CLEAR Continuous Memory. Refer to Quick Test Appendix. RERUN Quick Test.
		Yes ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.
DE93	CONTINUOUS MEMORY CODE 61: CHECK ECT SENSOR		
Continuous Memory Code 61 indicates that the Engine Coolant Temperature Sensor (ECT) signal went less than the Self-Test minimum value of 0.2 volts sometime during vehicle operation. Possible causes are: — Faulty ECT sensor — Grounded harness — Faulty processor • Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: — Lightly tap on ECT sensor (simulate road shock). — Wiggle ECT connector. • **Is a fault indicated?**		Yes ▶	DISCONNECT and INSPECT connectors. If connector and terminals are good, REPLACE ECT sensor. CLEAR Continuous Memory. Refer to Quick Test Appendix. RERUN Quick Test.
		No ▶	GO to DE94 .



A9587-B

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Engine Coolant Temperature Sensor (ECT) — Pinpoint Test DE

TEST STEP	RESULT ▶	ACTION TO TAKE
DE94 CHECK EEC-IV HARNESS		
o Still in Key On Engine Off Continuous Monitor mode. o Observe VOM or STAR LED for a fault indication while performing the following: — Referring to the illustration in Step DE93, grasp the harness closest to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV harness from the dash panel to the processor. o **Is a fault indicated?**	Yes ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory. Refer to Quick Test Appendix. RERUN Quick Test.
	No ▶	GO to DE95.
DE95 CHECK PROCESSOR AND HARNESS CONNECTORS		
o Key off, wait 10 seconds. o Disconnect processor 60 pin connector. o Inspect both connectors and connector terminals for obvious damage or faults. o **Are connectors and terminals OK?**	No ▶	SERVICE as necessary. CLEAR Continuous Memory. Refer to Quick Test Appendix. RERUN Quick Test.
	Yes ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.

* Can be purchased as a separate item.

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Manifold Absolute Pressure (MAP)/ Barometric Pressure (BP) Sensor

Pinpoint Test DF

Note

You should enter this Pinpoint Test only when a Service Code 22 or 72 is received in Quick Test Step 3.0, 5.0 or 6.0 or when directed here from Pinpoint Test S or Quick Test Step 7.0.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Unusually high/low barometric pressure.
- Kinked or obstructed vacuum lines (MAP).
- Basic engine (valves, vacuum leaks, timing, EGR valve, etc.).

This Pinpoint Test is intended to diagnose only the following:

- MAP/BP sensor (-9F479-)
- Harness circuits: VREF, MAP/BP SIGNAL, and SIGNAL RETURN
- Processor assembly (-12A650-)
- MAP vacuum line

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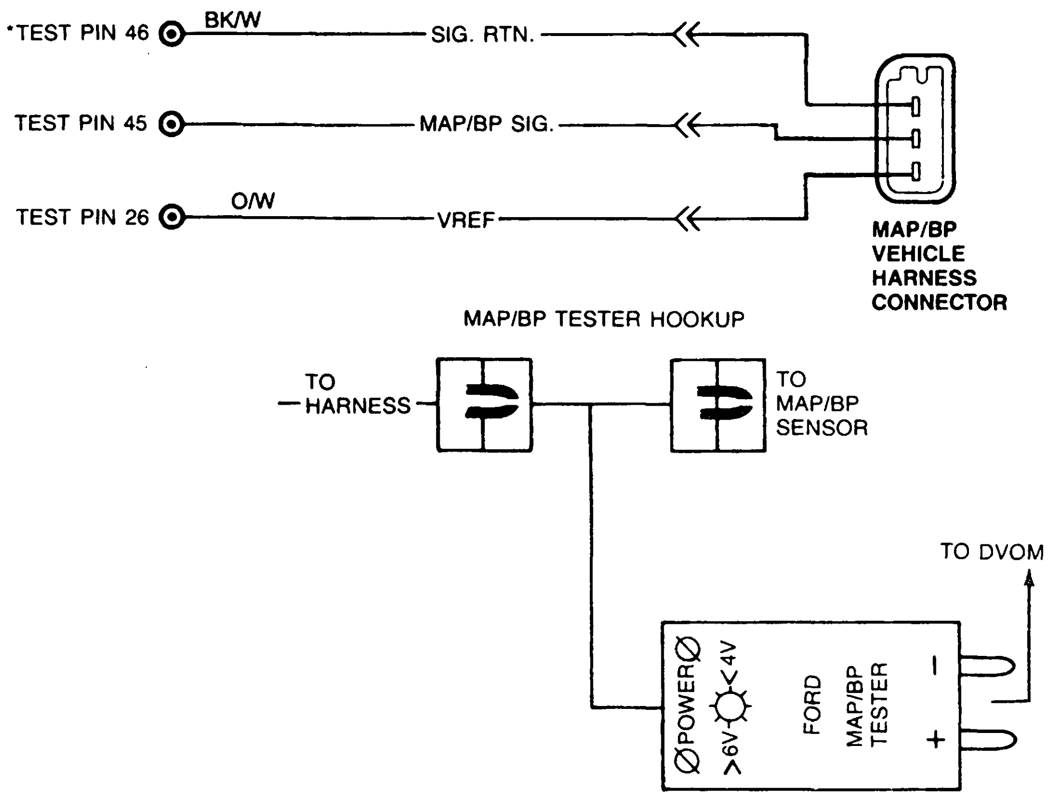
Manifold Absolute Pressure (MAP)/ Barometric Pressure (BP) Sensor

Pinpoint Test **DF**

Pinpoint Test Schematic



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9588-C

Test Pin 45 Manifold Absolute/Barometric Pressure	
Application	**Wire Colors**
3.8L RWD SEFI 5.0L SEFI All Trucks	DB/LG
All Other Passenger Cars	LG/BK

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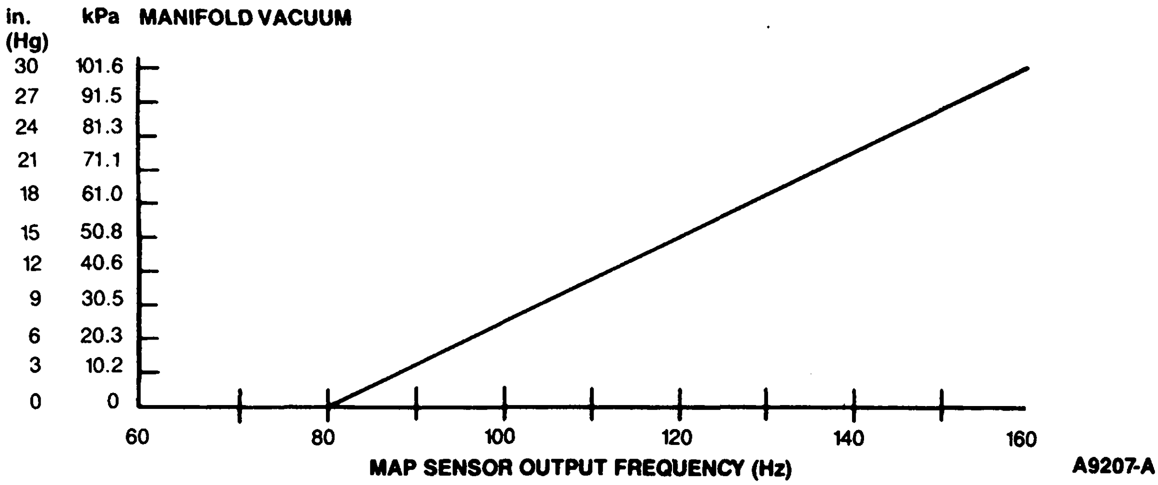
Manifold Absolute Pressure (MAP)/ Barometric Pressure (BP) Sensor

Pinpoint Test **DF**

MAP Sensor Graph

NOTE: MAP sensor output frequency versus manifold vacuum data is based on 30.0 in-Hg barometric pressure.



MAP Sensor Data

Manifold Vacuum		Frequency
in-Hg	kPa	Hz
0	0	80
3	10.2	88
6	20.3	95
9	30.5	102
12	40.6	109
15	50.8	117
18	61.0	125
21	71.1	133
24	81.3	141
27	91.5	150
30	101.6	159

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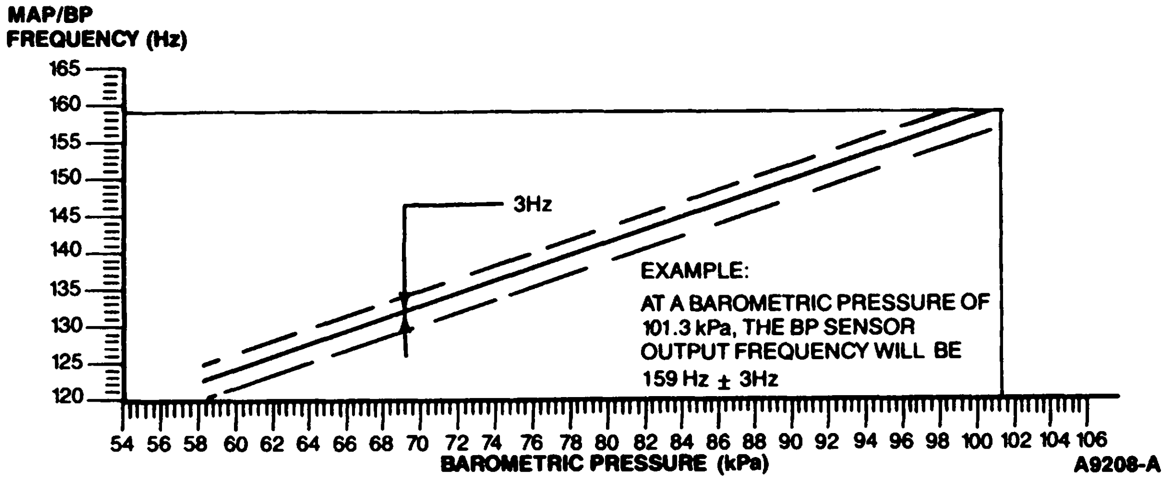
Manifold Absolute Pressure (MAP)/ Barometric Pressure (BP) Sensor

Pinpoint Test

DF

MAP/BP Sensor Graph (KOEO)

NOTE: Frequency may vary plus or minus 3 Hz from the values given due to sensor variations.



MAP/BP Sensor Data

Barometric Pressure in-Hg	kPa	Frequency Hz
17.1	58	122.4
18.3	62	125.5
19.5	66	128.7
20.7	70	131.9
21.8	74	135.1
23.0	78	138.3
24.2	82	141.8
25.4	86	145.4
26.6	90	148.9
27.7	94	152.5
28.9	98	156.1
30.1	102	159.6
31.0	105	162.4

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Manifold Absolute Pressure (MAP)/ Barometric Pressure (BP) Sensor — Pinpoint Test DF

TEST STEP	RESULT ▶	ACTION TO TAKE
DF1 SERVICE CODE 22: CONNECTING MAP/BP TESTER	Tester properly hooked up ▶	GO to DF2 .

Service Code 22 indicates that the Manifold Absolute Pressure (MAP)/Barometric Pressure (BP) sensor is out of self-test range. Correct range of measurement is typically from 1.4 to 1.6 volts.

Possible causes:

— MAP/BP signal output line open between sensor vehicle harness connector and processor.

— MAP/BP signal output line shorted to VREF, SIGNAL RETURN or GROUND.

— Faulty MAP/BP sensor.

— Vacuum trapped at MAP/BP sensor.

— High atmospheric pressure.

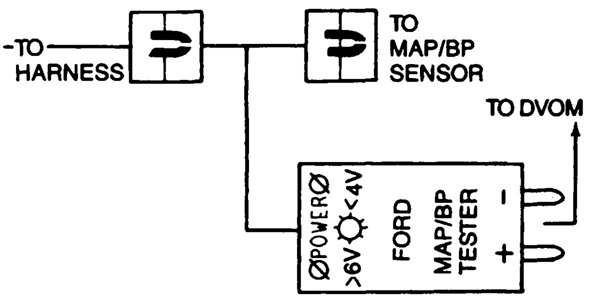
— Faulty processor.

— VREF open at sensor.

— SIG RTN open at sensor.

- Key off.
- Disconnect the MAP/BP sensor from the vehicle harness.
- Connect the MAP/BP tester between the vehicle harness and the MAP/BP sensor.
- Insert tester banana plugs into DVOM.
- Set DVOM to 20 volt scale.

MAP/BP TESTER HOOKUP



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Manifold Absolute Pressure (MAP)/ Barometric Pressure (BP) Sensor

Pinpoint Test DF

TEST STEP	RESULT ▶	ACTION TO TAKE
DF2 CHECK POWER TO MAP/BP SENSOR		
NOTE: Green light on tester indicates VREF is OK (4-6v). Red light (or no light) indicates VREF is either too low or too high. • MAP/BP tester connected. • Key on. • **Is green light on?**	Yes ▶ No ▶	GO to DF4. GO to DF3.
DF3 VREF ISOLATION		
NOTE: Green light reaffirms that VREF is OK (4-6v). Red light (or no light) indicates VREF is either too low or too high. • MAP/BP tester connected. • Key on. • Disconnect MAP/BP sensor. • **Is green light on?**	Yes ▶ No ▶	REPLACE MAP/BP sensor. RERUN Quick Test. REMOVE MAP/BP tester. RECONNECT the MAP/BP sensor. GO to Pinpoint Test Step C1.
DF4 MAP/BP TESTER OUTPUT READING		
NOTE: Measure several known good MAP sensors on available vehicles. The measured voltage will be typical for your location on the day of testing. • MAP tester connected. • Key on. • Measure MAP sensor voltage on customer vehicle. • **Is voltage in range for your altitude?**	Yes ▶ No ▶	REMOVE MAP/BP Tester. GO to DF5. REMOVE MAP/BP Tester. GO to DF6.

Approximate Altitude (Ft.)	Voltage Output (+/−.04 Volts)
0	1.59
1000	1.56
2000	1.53
3000	1.50
4000	1.47
5000	1.44
6000	1.41
7000	1.39

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Manifold Absolute Pressure (MAP)/ Barometric Pressure (BP) Sensor

Pinpoint Test DF

TEST STEP		RESULT ▶	ACTION TO TAKE
DF5	CHECK CONTINUITY OF MAP/BP SIGNAL		
	• Key off, wait 10 seconds. • Harness disconnected from MAP/BP sensor. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between MAP/BP signal at the MAP/BP sensor vehicle harness connector and Test Pin 45 at the breakout box. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	REPLACE processor. CONNECT harness and MAP/BP sensor. RERUN Quick Test. SERVICE circuit opens. REMOVE breakout box. RECONNECT processor and MAP/BP sensor. RERUN Quick Test.
DF6	CHECK MAP/BP SIGNAL FOR SHORTS TO VREF, SIGNAL RETURN AND GROUND		
	• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Harness disconnected from MAP/BP sensor. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 45 and Test Pins 26, 46, 40 and 60 at the breakout box. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE MAP/BP sensor. REMOVE breakout box. RECONNECT electrical connections. RERUN Quick Test. SERVICE circuit shorts. REMOVE breakout box. RECONNECT processor and MAP/BP Sensor. RERUN Quick Test.
DF7	SERVICE CODE 22: CHECK FOR EGR CODES		
	Service Code 22 (KOER) indicates the MAP/BP signal is out of range for Engine Running Self-Test. Possible causes: — Faulty MAP/BP sensor — Faulty vacuum lines — Excess EGR • **Are Service Codes 31, 32, 33, 34 or 35 present?**	Yes ▶ No ▶	GO to Quick Test Step 5.0 for appropriate Pinpoint Test. GO to $\boxed{\text{DF8}}$.

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Manifold Absolute Pressure (MAP)/ Barometric Pressure (BP) Sensor

Pinpoint Test DF

TEST STEP	RESULT ▶	ACTION TO TAKE
DF8 CHECK MAP SENSOR		
• Key off, wait 10 seconds. • Disconnect vacuum line from MAP sensor. • Install vacuum pump to MAP sensor. • Apply 18 in-Hg vacuum to MAP sensor. • **Does MAP sensor hold vacuum?**	Yes ▶ No ▶	RELEASE vacuum. GO to DF9 . REPLACE MAP sensor. CONNECT vacuum line to MAP sensor. RERUN Quick Test.
DF9 ATTEMPT TO ELIMINATE CODE 22 (ENGINE RUNNING)		
• Key off, wait 10 seconds. • Plug MAP vacuum supply hose. • Start engine and maintain 1500 ± 100 engine rpm. • Slowly apply 15 in-Hg vacuum to MAP sensor. • While maintaining rpm, perform Engine Running Self-Test. • **Is Code 22 still present?** **NOTE: Disregard any other codes at this time.**	Yes ▶ No ▶	REPLACE MAP sensor. CONNECT vacuum line to MAP sensor. RERUN Quick Test. INSPECT vacuum supply hose to MAP sensor. SERVICE as necessary. If OK, SERVICE other Engine Running codes. If none, GO to Diagnostic Routines, Section 2 for a low vacuum problem.
DF10 SERVICE CODE 72: CHECK VACUUM LINES		
Service Code 72 indicates that the manifold absolute pressure (MAP) sensor output did not change enough during the dynamic response test. Possible causes: — MAP sensor vacuum line improper routing, blockage and/or leakage. — Faulty MAP sensor. • Key on. • Check vacuum lines for proper routing. Refer to VECI decal. Check MAP sensor vacuum line for disconnections, kinks or blockage. • **Are vacuum lines O.K.?**	Yes ▶ No ▶	GO to DF11 . SERVICE vacuum lines as necessary. RERUN Quick Test.

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Manifold Absolute Pressure (MAP)/ Barometric Pressure (BP) Sensor | Pinpoint Test | DF

TEST STEP	RESULT ▶	ACTION TO TAKE
DF11 CHECK MAP SENSOR		
• Key off, wait 10 seconds. • Disconnect vacuum line from MAP sensor. • Install vacuum pump to MAP sensor. • Apply 18 in-Hg vacuum to MAP sensor. • **Does MAP sensor hold vacuum?**	Yes ▶	RELEASE vacuum. REMOVE vacuum pump. RECONNECT vacuum line to MAP sensor. GO to DF12 .
	No ▶	REPLACE MAP sensor. CONNECT vacuum line to MAP sensor. RERUN Quick Test.
DF12 CHECK THAT VACUUM TO MAP SENSOR DECREASES DURING DYNAMIC RESPONSE		
• Key off, wait 10 seconds. • Tee a vacuum gauge in the intake manifold vacuum line at the MAP sensor. • Perform Engine Running Self-Test while observing vacuum. • **Did vacuum decrease by more than 10 in-Hg vacuum during dynamic response test?**	Yes ▶	REMOVE vacuum gauge. REPLACE MAP sensor. RERUN Quick Test.
	No ▶	EEC-IV system O.K. REFER to Shop Manual, Group 21 for probable causes affecting engine vacuum.

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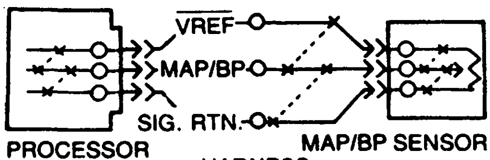
Manifold Absolute Pressure (MAP)/ Barometric Pressure (BP) Sensor — Pinpoint Test DF

TEST STEP	RESULT ▶	ACTION TO TAKE
DF90 SERVICE CODE 22: CONTINUOUS TEST: EXERCISE MAP/BP SENSOR		
Continuous Memory Service Code 22 indicates the Manifold Absolute Pressure (MAP)/Barometric Pressure (BP) sensor was out of self-test range. The code was set during normal driving conditions. Correct range of measurement is typically from 1.4 to 1.6 volts. Possible causes: — Faulty MAP/BP sensor — Faulty EEC-IV harness — Faulty MAP/BP sensor harness connectors and/or terminals — Unusually high/low barometric pressure • Using Key On Engine Off Continuous Monitor mode, observe VOM or STAR LED for indication of a fault while performing the following: • Connect a vacuum pump to the MAP/BP sensor. • Slowly apply 84 kPa (25 in-Hg) vacuum to the sensor. • Slowly bleed vacuum off the MAP/BP sensor. • Lightly tap on MAP/BP sensor (simulate road shock). • Wiggle MAP/BP connector. • **Is fault indicated?**	Yes ▶ No ▶	DISCONNECT and INSPECT connectors. If connector and terminals are good, REPLACE MAP/BP sensor. RERUN Quick Test. GO to DF91 .



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Manifold Absolute Pressure (MAP)/ Barometric Pressure (BP) Sensor

Pinpoint Test DF

TEST STEP	RESULT ▶	ACTION TO TAKE
DF91 CHECK EEC-IV HARNESS		
• Remain in Key On Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: — Referring to the illustration in Step DF90, grasp the harness closest to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV harness from the dash panel to the processor. • **Is a fault indicated?**	Yes ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory Code. REFER to Quick Test Appendix. RERUN Quick Test.
	No ▶	GO to DF92 .
DF92 CHECK PROCESSOR AND HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. • Inspect connectors and connector terminals for obvious damage or faults. • **Are connectors and terminals OK?**	No ▶	SERVICE as necessary. RERUN Quick Test.
	Yes ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnosis supplement, Section 18.* All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.

* Can be purchased as a separate item.

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Knock Sensor

Pinpoint Test **DG**

Note

You should enter this Pinpoint Test only when a Service Code 25 is received in Quick Test Step 5.0 or 7.0.

Remember

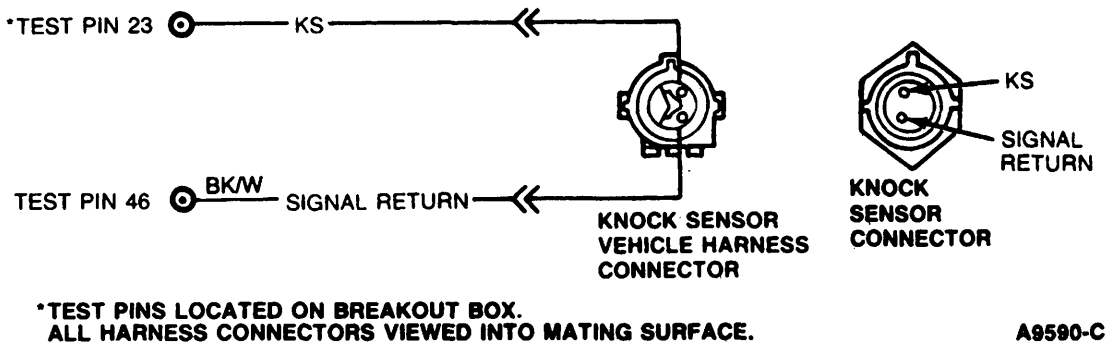
To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Fuel (quality)
- Basic engine
- Spark timing

This Pinpoint Test is intended to diagnose only the following:

- Knock sensor (-12A699-)
- Harness circuits: KS and SIGNAL RETURN
- Processor assembly (-12A650-)

Pinpoint Test Schematic



Test Pin 23 **KS Signal**

Application	Wire Color
Car: 2.3L OHC 2.3L TC 3.0L SHO-MA 3.8L SUP-CHG	Y/R
Truck: 4.9L/5.0L	LG/BK

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Knock Sensor | Pinpoint Test | DG

TEST STEP	RESULT ▶	ACTION TO TAKE
DG1 SERVICE CODE 25: GENERATE KNOCK MANUALLY		
Service Code 25 indicates that the Knock Sensor (KS) signal to the processor was not sensed during the dynamic response test after the I.D. code in Key On Engine Running Self-Test. Possible causes are: — Faulty knock sensor — Open or shorted harness — Faulty processor Since knock conditions are sensitive to fuel, altitude and weather in addition to ignition timing, perform Step DG1 before servicing any components. • Locate knock sensor and prepare to rap/tap on exhaust manifold with a 4 oz. hammer. • Run Engine Running Self-Test (engine must be at operating temperature). • Tap exhaust manifold directly above the knock sensor immediately after the dynamic response code is given. **NOTE: It is not necessary to "goose" the throttle. Ignore all other codes except Code 25.** • **Is service Code 25 present?**	Yes ▶ No ▶	GO to DG2 . Knock system OK. RERUN Engine Running Self-Test and SERVICE any other codes from that test.
DG2 TEST KNOCK CIRCUIT FOR VOLTAGE		
• Key off, wait 10 seconds. • Disconnect knock sensor connector. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between KS and SIGNAL RETURN at the vehicle harnes connector.	Voltage is between 1 and 4 volts ▶ Voltage is less than 1 volt ▶ Voltage is greater than 4 volts ▶	GO to DG6 . GO to DG3 . GO to DG5 .

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Knock Sensor

Pinpoint Test **DG**

TEST STEP	RESULT ▶	ACTION TO TAKE
DG3 CHECK CONTINUITY OF KS AND SIGNAL RETURN CIRCUITS		
o Key off, wait 10 seconds. o Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o Install breakout box, leave processor disconnected. o Knock sensor disconnected. o DVOM on 200 ohm scale. o Measure resistance between SIGNAL RETURN at the knock sensor vehicle harness connector and Test Pin 46 at the breakout box and between KS at the knock sensor vehicle harness connector and Test Pin 23 at the breakout box. o **Are both resistances less than 5.0 ohms?**	Yes ▶ No ▶	GO to DG4 . REMOVE breakout box. RECONNECT processor and knock sensor. SERVICE open circuit. RERUN Quick Test.
DG4 CHECK KS CIRCUIT FOR SHORT TO GROUND		
o Key off, wait 10 seconds. o Breakout box installed, processor disconnected. o Knock sensor disconnected. o DVOM on 200,000 ohm scale. o Measure resistance between KS at the knock sensor vehicle harness connector and Test Pins 40, 46 and 60 at the breakout box. o **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT processor. GO to DG6 . REMOVE breakout box. RECONNECT processor and knock sensor. SERVICE short circuit. RERUN Quick Test.
DG5 CHECK KS CIRCUIT FOR SHORT TO VOLTAGE		
o Key off, wait 10 seconds. o Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o Install breakout box, leave processor disconnected. o Knock sensor disconnected. o Key on, engine off. o DVOM on 20 volt scale. o Measure voltage between Test Pin 23 and Test Pin 40 at the breakout box. o **Is voltage less than 0.5 volts?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT processor. GO to DG6 . REMOVE breakout box. RECONNECT processor and knock sensor. SERVICE short circuit. RERUN Quick Test.

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Knock Sensor

Pinpoint Test **DG**

TEST STEP	RESULT ▶	ACTION TO TAKE
DG6 TEST PROCESSOR WITH SUBSTITUTE KNOCK SENSOR		
• Key off, wait 10 seconds. • Connect a known good knock sensor to the vehicle harness. • Do not install this sensor on the engine. • Run Engine Running Self-Test. (Engine must be at operating temperature). • Tap the substitute knock sensor with a 4 oz. hammer immediately after the dynamic response code is given. **NOTE: It is not necessary to "goose" the throttle. Ignore all other codes except Code 25.** • **Is service Code 25 present?**	Yes ▶ No ▶	REPLACE processor. RECONNECT original knock sensor. RERUN Quick Test. INSTALL new knock sensor. RERUN Quick Test.

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Throttle Position Sensor (TPS) | Pinpoint Test | DH

Note

You should enter this Pinpoint Test only when a Service Code 23, 53, 63 or 73 is received in Quick Test Step 3.0, 5.0 or 6.0.

Remember

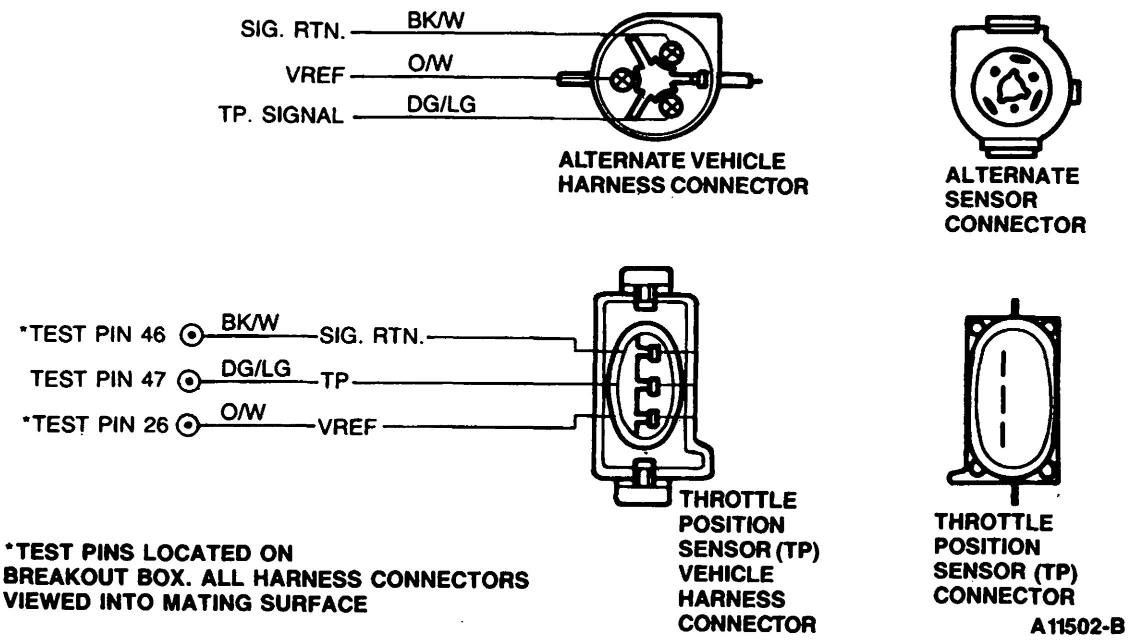
To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Idle speeds/throttle stop adjustment
- Binding throttle shaft/linkage or speed control linkage
- Choke/high cam system, if equipped

This Pinpoint Test is intended to diagnose only the following:

- TP sensor (-9B989-)
- Sensor harness circuits: VREF, TP SIGNAL, and SIGNAL RETURN
- Processor assembly (-12A650-)

Pinpoint Test Schematic



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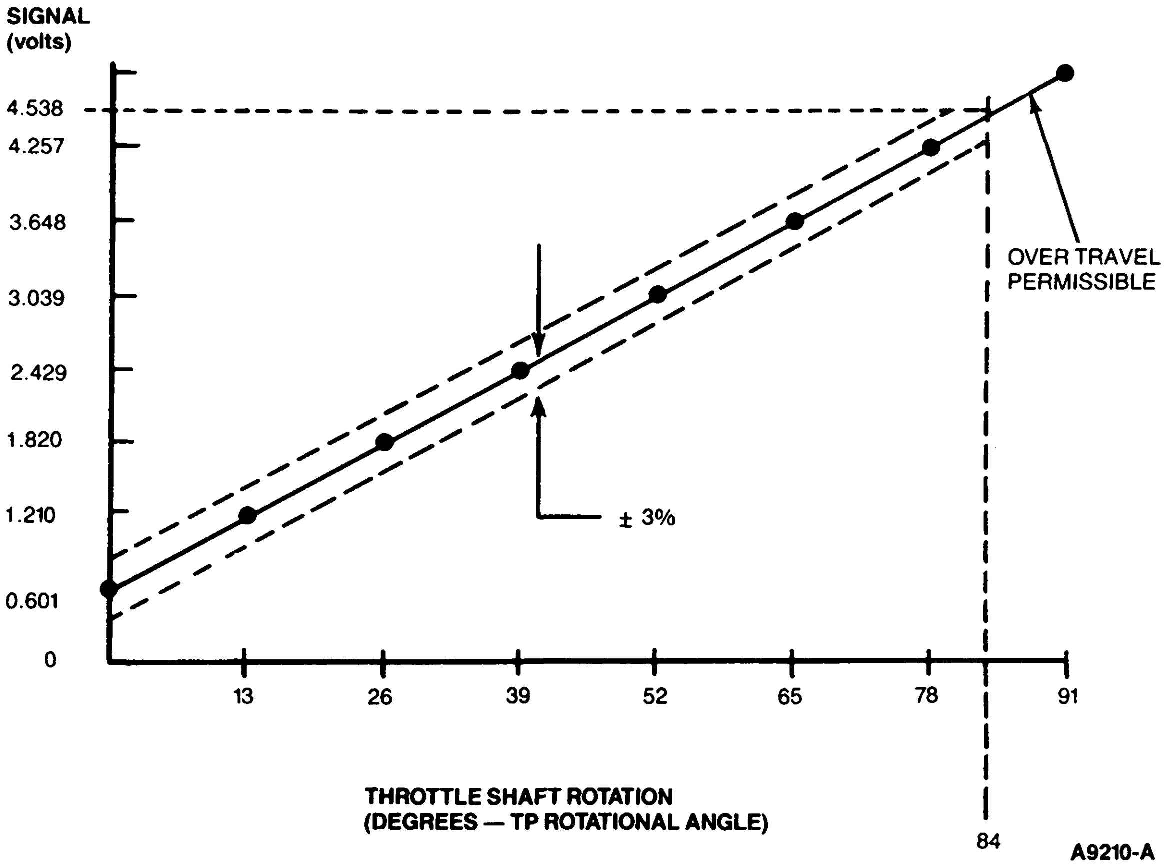
Throttle Position Sensor (TPS)

Pinpoint Test **DH**

NOTE: The normal range of the throttle angle measurement for the Throttle Position Sensor is from 0 to 85 degrees. To pass Quick Test, the throttle rotational setting on the throttle position sensor (Key On Engine Off and Key On Engine Running), and the maximum/minimum TP circuit operating voltage ranges are listed in Table #1 by engine application.

TP Sensor Graph



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Throttle Position Sensor (TPS)

Pinpoint Test DH

Table #1

Throttle Position Sensor Specifications

Throttle Position Sensor Setting (K.O.E.O. and K.O.E.R.)			TP Circuit (Signal) Operating Voltage Range (K.O.E.O.)	
Engine Application	Rotational Degree Range	Voltage Range	Minimum	Maximum
Passenger Car:				
1.9L EFI	4° - 13°	0.80 - 1.20	0.24	4.84
1.9L CFI	0° - 12° (off) 2.5° - 14° (run)	0.49 - 1.15 0.71 - 1.25	0.39	4.84
2.3L OHC-EFI	0° - 13.5°	0.59 - 1.22	0.20	4.84
2.3L TC-EFI	2.5° - 15°	0.71 - 1.30	0.20	4.84
2.3L HSC-EFI	3° - 13.5°	0.73 - 1.22	0.20	4.84
2.5L HSC-CFI	1° - 15° (off) 3.5° - 25° (run)	0.66 - 1.30 0.76 - 1.78	0.39	4.84
3.0L EFI	0° - 13.5°	0.59 - 1.22	0.34	4.84
3.0L SHO-MA SEFI	0° - 4.5°	0.38 - 0.82	0.23	4.89
3.8L FWD/RWD 3.8L/5.0L SEFI	3° - 13.5°	0.73 - 1.22	0.39	4.84
3.8L SC MA 5.0L MA-SEFI	0° - 13.5°	0.49 - 1.22	0.39	4.84
Truck:				
2.3L DIS-EFI	0° - 13.5°	0.59 - 1.22	0.34	4.84
2.9L EFI	0° - 13.5°	0.59 - 1.22	0.34	4.84
3.0L EFI	0° - 13.5°	0.59 - 1.22	0.34	4.84
4.9L EFI	3° - 13.5°	0.73 - 1.22	0.20	4.84
5.0L EFI	3° - 13.5°	0.73 - 1.22	0.20	4.84
5.8L EFI	3° - 13.5°	0.73 - 1.22	0.20	4.84
7.5L EFI	3° - 13.5°	0.73 - 1.22	0.20	4.84
5.8L/7.5L EFI E4OD	3° - 13.5°	0.73 - 1.22	0.34	4.84

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Throttle Position Sensor (TPS) — Pinpoint Test DH

TEST STEP	RESULT ▶	ACTION TO TAKE
DH1 SERVICE CODE 23: THE FOLLOWING CHECK MUST BE MADE BEFORE SERVICING THIS CODE		
Service Code 23 indicates that the Throttle Position sensor's (TP) rotational setting may be out of self-test range (Refer to Table #1). Possible causes are: — Binding throttle linkage — Faulty TP sensor — Faulty processor • Check for Code 68; Key On Engine Off or Codes 58, 31 or 41 Engine Running. • **Are any of the above Codes present?**	Yes ▶	RETURN to the Key On Engine Off or Engine Running service code chart and PROCEED as directed.
	No ▶	GO to DH2.
DH2 CHECK FOR STUCK THROTTLE PLATE		
• Visually inspect carburetor/throttle body and throttle linkage for binding or sticking. • Verify the throttle linkage is at mechanical/closed throttle. Check for: binding throttle linkage, speed control linkage, vacuum line/electrical harness interference, etc. • **Does throttle move freely and return to closed throttle position?**	Yes ▶	GO to DH3.
	No ▶	SERVICE as necessary. RERUN Quick Test.
DH3 SERVICE CODE 53: ATTEMPT TO GENERATE CODE 63		
Service Code 53 indicates that the Throttle Position sensor (TP) signal is greater than the self-test maximum value (Refer to Table #1). Possible causes are: — Faulty TP sensor — Short to power in harness — Faulty processor • Refer to schematic in Pinpoint Test DH. • Key off, wait 10 seconds. • Disconnect TP sensor vehicle harness connector at the throttle body. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. • RERUN Key On Engine Off Self-Test. • **Is Code 63 present?** **NOTE: Ignore all other codes at this time.**	Yes ▶	GO to DH4.
	No ▶	GO to DH5.

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Throttle Position Sensor (TPS)

Pinpoint Test DH

TEST STEP	RESULT ▶	ACTION TO TAKE
DH4 CHECK VOLTAGE VREF TO SIGNAL RETURN		
o Refer to schematic in Pinpoint Test DH. o Key off, wait 10 seconds. o Disconnect TP vehicle harness connector at throttle body. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. o DVOM on 20 volt scale. o Key on, engine off. o Measure voltage between VREF and SIGNAL RETURN at the TP vehicle harness connector. o **Is voltage between 4.0 and 6.0 volts?**	Yes ▶ No ▶	REPLACE TP sensor. REFER to Section 3 for adjustment procedures for EFI/SEFI applications. RERUN Quick Test. RECONNECT TP sensor. GO to Pinpoint Test Step C1 .
DH5 CHECK TP SIGNAL FOR SHORT TO POWER		
o Key off, wait 10 seconds, TP harness disconnected. o DVOM on 200,000 ohm scale. o Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o Install breakout box, leave processor disconnected. o Measure resistance between Test Pin 47 and Test Pins 26 and 57 at the breakout box. o **Are both resistances greater than 10,000 ohms?**	No ▶ Yes ▶	SERVICE short circuit. REMOVE breakout box. RECONNECT TP sensor and processor. RERUN Quick Test. REMOVE breakout box. REPLACE processor. RECONNECT TP sensor and processor. RERUN Quick Test.

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Throttle Position Sensor (TPS) — Pinpoint Test DH

TEST STEP	RESULT ▶	ACTION TO TAKE
DH10 SERVICE CODE 63: ATTEMPT TO GENERATE CODE 53		
Service Code 63 indicates that the Throttle Position sensor (TP) signal is less than the self-test minimum value (Refer to Table #1). Possible causes are: — Faulty TP sensor — Open harness — Grounded harness — Faulty processor • Key off, wait 10 seconds, TP harness disconnected. • Jumper VREF to TP signal at TP vehicle harness connector. • Perform Key On Engine Off Self-Test. **NOTE: If no codes are generated, immediately remove jumper and go directly to DH13.** • **Is Code 53/23 present?** **NOTE: Ignore all other codes at this time.**	Yes ▶	REPLACE TP sensor, REFER to Section 3 for adjustment procedures for EFI/SEFI applications and REMOVE jumper wire. RECONNECT TP sensor. RERUN Quick Test.
	No ▶	REMOVE jumper, GO to DH11.
DH11 SERVICE CODE 63: CHECK VOLTAGE VREF TO SIGNAL RETURN		
• Refer to schematic in Pinpoint Test DH. • Key off, wait 10 seconds. • Disconnect TP vehicle harness connector at throttle body. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. • DVOM on 20 volt scale. • Key on engine off. • Measure voltage between VREF and SIGNAL RETURN at the TP vehicle harness connector. • **Is voltage between 4.0 and 6.0 volts?**	Yes ▶	GO to DH12.
	No ▶	GO to Pinpoint Test Step C1.

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Throttle Position Sensor (TPS)

Pinpoint Test DH

TEST STEP	RESULT ▶	ACTION TO TAKE
DH12 CHECK CONTINUITY OF TP CIRCUIT		
o Key off, wait 10 seconds. o TP harness disconnected. o DVOM on 200 ohm scale. o Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o Install breakout box and connect processor to breakout box. o Measure resistance between TP SIGNAL at the vehicle harness connector and Test Pin 47 at the breakout box. o **Is the resistance less than 5.0 ohms?**	No ▶ Yes ▶	SERVICE open circuit. RECONNECT harness to sensor. REMOVE breakout box and RERUN Quick Test. GO to DH13 .
DH13 CHECK RESISTANCE OF TP CIRCUIT TO GROUND/SIGNAL RETURN		
o Key off, wait 10 seconds. o TP harness disconnected. o Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o DVOM on 200,000 ohm scale. o Measure resistance between TP SIGNAL at TP vehicle harness connector and Test Pin 46 at the breakout box and between TP SIGNAL at TP vehicle harness connector and ground. o **Are all resistances greater than 10,000 ohms?**	No ▶ Yes ▶	SERVICE short circuit. REMOVE breakout box. RECONNECT processor and TP sensor. RERUN Quick Test. REMOVE breakout box. REPLACE processor. RECONNECT processor and TP sensor. RERUN Quick Test.

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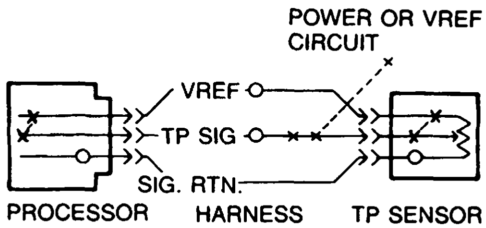
Throttle Position Sensor (TPS) | Pinpoint Test | DH

TEST STEP	RESULT ▶	ACTION TO TAKE
DH20 ENGINE RUNNING SERVICE CODE 73: CHECK TP SENSOR MOVEMENT DURING DYNAMIC RESPONSE TEST		
NOTE: Engine Running Service Code 73 indicates the TP Sensor did not exceed 25 percent of its rotation in the Engine Response Check. • Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • DVOM on 20 volt scale. • Connect DVOM to Test Pins 47 and 46 at the breakout box. • Perform Engine Running Self-Test, Step 5.0. • **Does voltage increase to greater than 3.5 volts during the dynamic response test?**	Yes ▶ No ▶	REMOVE breakout box. REPLACE processor. RERUN Quick Test. VERIFY TP Sensor is properly installed to throttle body. If OK, REPLACE TP Sensor. REFER to Section 3 for adjustment procedure for EFI/SEFI applications. RERUN Quick Test.
DH90 CONTINUOUS MEMORY CODE 53: MONITOR TP CIRCUIT UNDER SIMULATED ROAD SHOCK		
• Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: — Move throttle slowly to WOT position. — Release throttle slowly to closed position and lightly tap on TP sensor (simulate road shock). — Wiggle TP harness connector. • **Does VOM or STAR LED indicate a fault?**  **A9468-A**	Yes ▶ No ▶	GO to DH91. GO to DH92.

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Throttle Position Sensor (TPS) — Pinpoint Test DH

TEST STEP	RESULT ▶	ACTION TO TAKE
DH91 MEASURE THROTTLE POSITION SIGNAL VOLTAGE WHILE EXERCISING TP SENSOR		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • VOM or STAR LED still connected to STO as in previous step. • Connect a DVOM from Test Pin 47 to Test Pin 46. • DVOM on 20 volt scale. • Key on engine off. • While observing DVOM, repeat Step DH90. • **Does the fault occur below 4.25 volts?**	Yes ▶	DISCONNECT and INSPECT connectors. If connector and terminals are good, REPLACE TP sensor, REFER to Shop Manual, Group 24. CLEAR Continuous Memory Code 53. REFER to Quick Test Appendix. RERUN Quick Test.
	No ▶	Throttle position sensor overtravel may have caused the Continuous Memory Code 53. VERIFY harness integrity, GO to DH92.
DH92 CHECK EEC-IV HARNESS		
• Still in Key On Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: — Referring to the illustration in Step DH90, grasp the harness close to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV harness from the dash panel to the processor. • **Does VOM or STAR LED indicate a fault?**	Yes ▶	ISOLATE fault. SERVICE as necessary. REFER to appropriate figure. CLEAR Continuous Memory Code 53. REFER to Quick Test Appendix. RERUN Quick Test.
	No ▶	GO to DH93.

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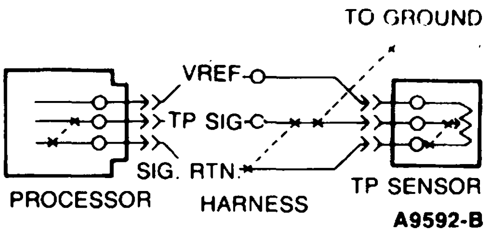
Throttle Position Sensor (TPS) | Pinpoint Test | DH

TEST STEP	RESULT ▶	ACTION TO TAKE
DH93 CHECK PROCESSOR AND HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • **Are connectors and terminals OK?**	No ▶	SERVICE as necessary. CLEAR Continuous Memory Code 53. REFER to Quick Test Appendix. RERUN Quick Test.
	Yes ▶	Unable to duplicate fault at this time. CLEAR Continuous Memory Code 53. REFER to Quick Test Appendix. Continuous Memory Code 53 testing complete.
DH94 CONTINUOUS MEMORY CODE 63: MONITOR TP CIRCUIT UNDER SIMULATED ROAD SHOCK		
• Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: — Move throttle slowly to WOT position. — Release throttle slowly to closed condition. — Lightly tap on TP sensor (simulate road shock). — Wiggle TP harness connector. • **Does VOM or STAR LED indicate a fault?**  A9592-B	Yes ▶	INSPECT connectors. If connector and terminals are good, REPLACE TP sensor, REFER to Shop Manual, Group 24. CLEAR Continuous Memory Code 63. REFER to Quick Test Appendix. RERUN Quick Test.
	No ▶	GO to DH95 .

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Throttle Position Sensor (TPS)

Pinpoint Test DH

TEST STEP	RESULT ▶	ACTION TO TAKE
DH95 CHECK EEC-IV HARNESS		
o Still in Key On Engine Off Continuous Monitor mode. o Observe VOM or STAR LED for a fault indication while performing the following: — Referring to the illustration in Step DH94 grasp the harness close to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV harness from the dash panel to the processor. o **Does VOM or STAR LED indicate a fault?**	Yes ▶	ISOLATE fault. SERVICE as necessary. REFER to appropriate figure. CLEAR Continuous Memory Code 63. REFER to Quick Test Appendix. RERUN Quick Test.
	No ▶	GO to DH96 .
DH96 CHECK PROCESSOR AND HARNESS CONNECTORS		
o Key off, wait 10 seconds. o Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. o **Are connectors and terminals OK?**	No ▶	SERVICE as necessary. CLEAR Continuous Memory Code 63. REFER to Quick Test Appendix. RERUN Quick Test.
	Yes ▶	Unable to duplicate fault at this time. CLEAR Continuous Memory Code 63. REFER to Quick Test Appendix. Continuous Memory Code 63 testing complete.

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Engine RPM Sensor (Diesel)

Pinpoint Test

DI

Note

You should enter this Pinpoint Test only when a Service Code 14 is received in Quick Test 6.0, or when directed here from Quick Test Step 7.0.

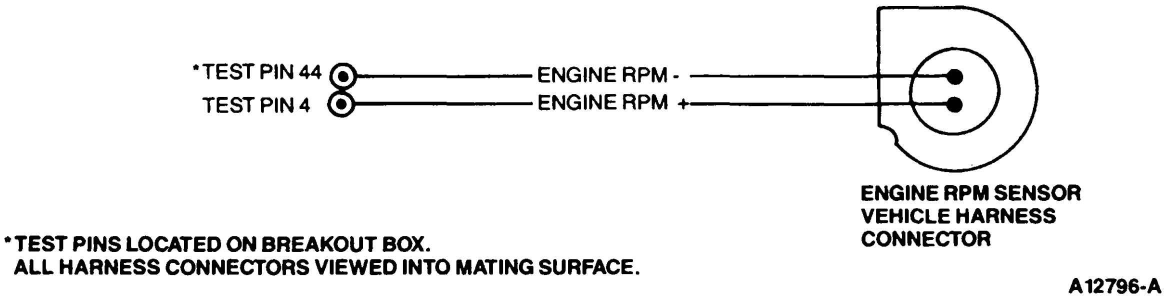
Remember

To prevent the replacement of good components and spending needless time on diagnostics, verify proper Engine RPM sensor installation and complete electrical connection.

This Pinpoint Test is intended to diagnose only the following:

- Engine RPM sensor harness circuits
- Engine RPM sensor (-17B384-)
- Processor assembly (-12B565-)

Pinpoint Test Schematic



Test Pin 44	Engine RPM –
Application	**Wire Color**
E-Series:	BK/LG
F-Series:	BK/Y

Test Pin 4	Engine RPM+
Application	**Wire Color**
E-Series:	DB
F-Series:	DG/Y

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Engine RPM Sensor (Diesel) | Pinpoint Test | DI

TEST STEP	RESULT ▶	ACTION TO TAKE
DI1 CONTINUOUS MEMORY CODE 14: ERRATIC ENGINE RPM SIGNAL		
NOTE: To prevent the replacement of good components, verify proper Engine RPM sensor installation and complete electrical connection. Service Code 14 indicates the Engine RPM signal output was missing pulses while the engine was running. o Check EEC-IV systems harness for: — Loose wires/connectors — On board transmitter (2-way radio) — On board telephone, etc. o Verify installations have been performed according to manufacturers instructions and specifications regarding routing of antenna and wire leads. o Key off, wait 10 seconds. o Enter Engine Running Continuous Monitor mode. Refer to Quick Test Appendix. o Observe VOM or STAR LED for indication of a fault while performing the following: — Lightly tap on the Engine RPM sensor. — Wiggle the Engine RPM sensor connector. **NOTE: Continuous Monitor mode may exit while a fault is indicated, you have to reenter to diagnose further.** o **Is a fault indicated?**	Yes ▶ No ▶	SERVICE as necessary. CLEAR Continuous Memory Code 14. RERUN Quick Test. GO to **DI2**.
DI2 CHECK EEC-IV HARNESS		
o While still in Continuous Monitor mode from **DI1** observe VOM or STAR LED for a fault indication while performing the following: — Grasp the harness close to the Engine RPM sensor. Wiggle shake or bend a small section at the time while working your way toward the dash panel and the EEC-IV processor. Isolate the engine rpm circuit for this test. o **Is a fault indicated?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory Code 14. RERUN Quick Test. GO to **DI3**.

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Engine RPM Sensor (Diesel)

Pinpoint Test DI

TEST STEP		RESULT ▶	ACTION TO TAKE
DI3	CHECK CONTINUITY OF ENGINE RPM SENSOR HARNESS		
	• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Disconnect the Engine RPM sensor. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 4 at the breakout box and the Engine RPM sensor harness connector. • Measure resistance between Test Pin 44 at the breakout box and the Engine RPM sensor harness connector. • **Are both resistances less than 5 ohms?**	Yes ▶ No ▶	GO to DI4 . SERVICE open circuit. REMOVE breakout box. RECONNECT processor and Engine RPM sensor.
DI4	CHECK ENGINE RPM SENSOR HARNESS FOR SHORTS TO POWER OR GROUND		
	• Key off. • Breakout box installed, processor disconnected. • Engine RPM sensor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 4 and Test Pins 37/57, 40, and 44 at the breakout box. • Measure resistance between Test Pin 44 and Test Pins 37/57 at the breakout box. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to DI5 . SERVICE short circuit. REMOVE breakout box. RECONNECT processor and Engine RPM sensor.
DI5	CHECK ENGINE RPM SENSOR		
	• Key off. • Engine RPM sensor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between engine rpm sensor terminals at the RPM sensor. • **Is the resistance between 2,400 and 2,800 ohms?**	Yes ▶ No ▶	REPLACE processor. RECONNECT Engine RPM sensor. RERUN Quick Test. GO to Light Truck Shop Manual Section 33-06 Tachometer 7.3L Diesel diagnosis.

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Vane Airflow Sensor (VAF)

Pinpoint Test

DK

Note

You should enter this Pinpoint Test only when a Service Code 26, 56, 66 or 76 is received in Quick Test Step 3.0, 5.0, or 6.0.

Remember

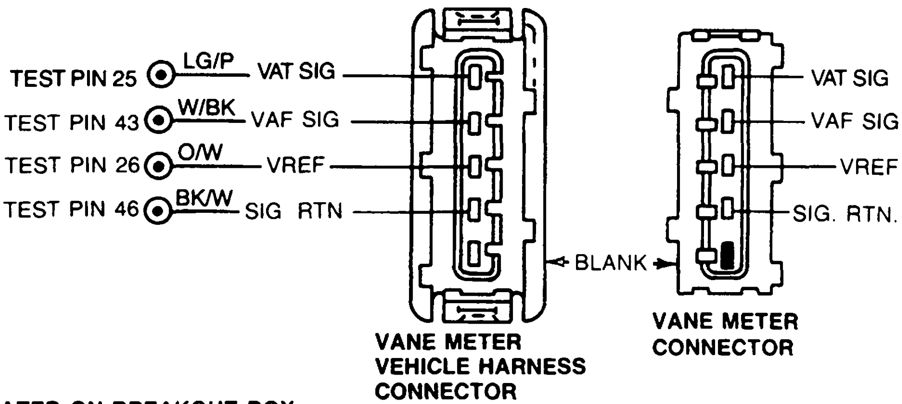
To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Check for unmetered air (air leaks) between VAF meter and throttle body
- Vacuum leaks
- Engine sealing (PCV sealing, CANP, valve cover seal dipstick seated)

This Pinpoint Test is intended to diagnose only the following:

- VAF meter (-12B529-)
- Processor (-12A650-)
- Harness circuits: VREF, VAF SIGNAL and SIGNAL RETURN

Pinpoint Test Schematic



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

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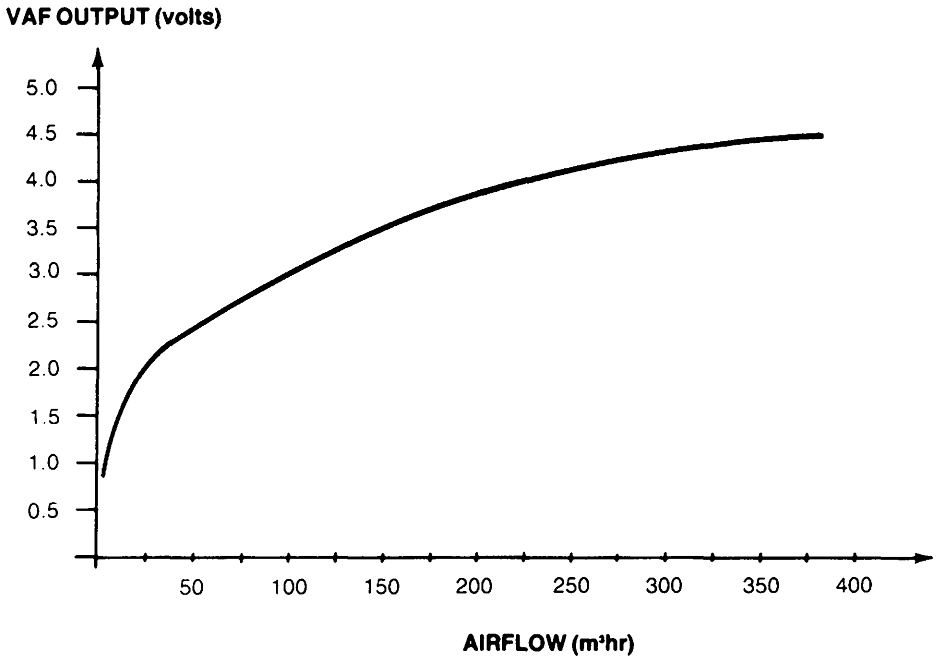
Vane Airflow Sensor (VAF) | Pinpoint Test | DK

NOTE: Airflow = Volume of air flowing through meter per hour.
As the volume of air flowing through the meter increases, so will the VAF output voltage.

Vane Airflow Sensor Graph

1.9L EF1 Engine



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VAF Sensor Data

Airflow	VAF Output
m³/hr	Volt
9	0.80
16	1.35
26	1.85
40	2.25
60	2.65
100	3.15
160	3.60
240	4.0
380	4.5

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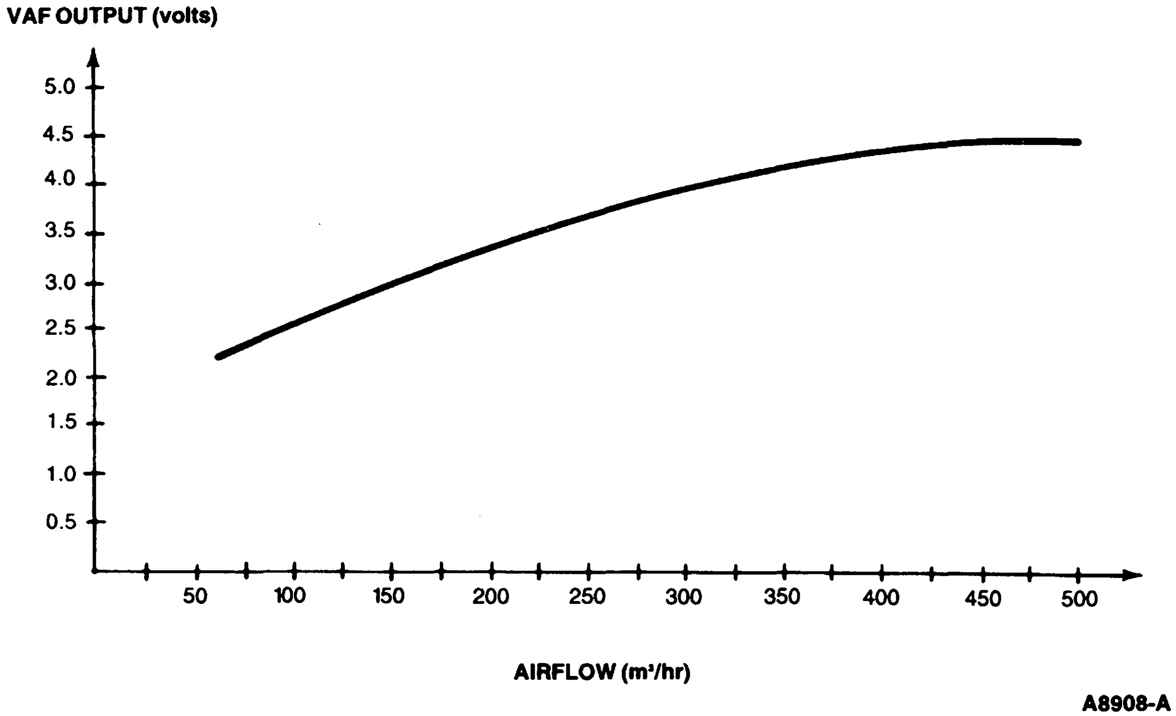
Vane Airflow Sensor (VAF)

Pinpoint Test **DK**

NOTE: Airflow = Volume of air flowing through meter per hour. As the volume of air flowing through the meter increases, so will the VAF output voltage.

Vane Airflow Sensor Graph

2.3L EFI-TC Engine



VAF Sensor Data

Airflow	VAF Output
m^3/hr	Volts
60	2.20
90	2.60
140	3.10
200	3.45
300	3.90
500	4.40

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Vane Airflow Sensor (VAF) — Pinpoint Test DK

TEST STEP	RESULT ▶	ACTION TO TAKE
DK1 SERVICE CODE 26: CHECK VANE METER FOR CONTAMINATION AND FREEDOM OF MOVEMENT		
Service Code 26 indicates that the vane airflow (VAF) sensor is out of Self-Test range. Correct range of measurement is 0.17 to 0.50 volts (KOEO) or 1.10 to 1.70 volts (KOER). Possible causes: — Faulty vane meter — Faulty processor — Faulty wire harness connections • Key off, wait 10 seconds. • Remove air cleaner element and check for contamination (oil residue, foreign material, etc.) that may impede VAF sensor vane movement and service as necessary. • **Was service Code 26 present in Key On Engine Off Self-Test?**	Yes ▶ No ▶	REFER to Section 3, Vane Air Meter Diagnosis. GO to DK2 .

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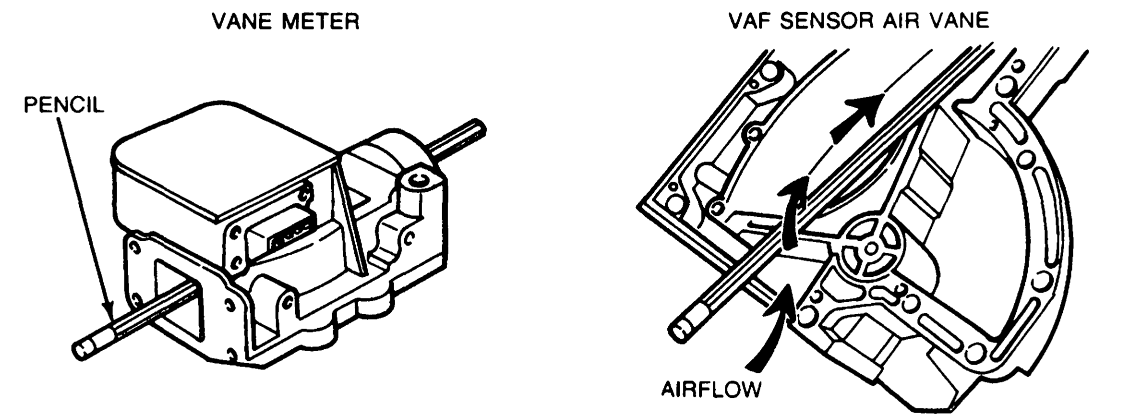
Vane Airflow Sensor (VAF)

Pinpoint Test DK

TEST STEP	RESULT ▶	ACTION TO TAKE
DK2 CHECK VAF SENSOR		
○ Key off. ○ Check for unmetered air leaks between vane meter and throttle body. ○ Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. ○ Install breakout box and connect processor to breakout box. ○ DVOM on 20 volt scale. ○ Key on, engine off. ○ Place new unsharpened pencil as shown below. ○ Measure voltage between Test Pins 43 and 46 at the breakout box. ○ **Is voltage between 2.8 volts and 3.7 volts?**	Yes ▶	Vane meter is capable of outputting an acceptable signal. The Code 26 has been caused by incorrect engine speed or an unmetered air leak (vacuum leak). 1.9L EFI, GO to KD 15. All others, SERVICE as necessary. REMOVE breakout box. RERUN Quick Test.
	No ▶	REMOVE breakout box. INSPECT vane meter connectors for bent pins. SERVICE as necessary. RERUN Quick Test. REPLACE vane meter if problem still exists.



NOTE: REFER TO COVER PAGE FOR HARNESS CONNECTOR PIN ASSIGNMENTS. A9594-D

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Vane Airflow Sensor (VAF) — Pinpoint Test DK

TEST STEP	RESULT ▶	ACTION TO TAKE
DK10 SERVICE CODE 56: INDUCE OPPOSITE CODE		
Service Code 56 indicates that the vane airflow (VAF) sensor signal is greater than the Self-Test maximum value of 4.89 volts (KOEO). Possible causes: — Faulty vane meter — Faulty processor — VAF signal output line shorted to power; faulty wire harness • Key off, wait 10 seconds. • Disconnect vehicle harness from vane meter. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Rerun Key On Engine Off Self-Test. • **Is Code 66 present?**	Yes ▶ No ▶	GO to DK11. GO to DK12.
DK11 CHECK VAF TO SIGNAL RETURN VOLTAGE		
• Key off, wait 10 seconds. • Harness disconnected from vane meter. • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage at the vane meter vehicle harness connector between VREF and SIGNAL RETURN. • **Is voltage between 4.0 and 6.0 volts?**	Yes ▶ No ▶	REPLACE vane meter. RECONNECT harness. RERUN Quick Test. GO to Pinpoint Test Step C1.
DK12 CHECK VAF SIGNAL FOR SHORT TO POWER		
• Key off, wait 10 seconds. • Harness disconnected from vane meter. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 43 and Test Pins 26 and 57 at the breakout box. • **Are both resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT processor and vane meter. RERUN Quick Test. SERVICE circuit shorts. REMOVE breakout box. RECONNECT processor and vane meter. RERUN Quick Test.

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Vane Airflow Sensor (VAF)

Pinpoint Test DK

TEST STEP	RESULT ▶	ACTION TO TAKE
DK20 SERVICE CODE 66: INDUCE OPPOSITE CODE		
Service Code 66 indicates that the vane airflow (VAF) sensor signal is less than the Self-Test minimum of 0.17 volts (KOEO). Possible causes: — Faulty vane meter — Lack of continuity between vane meter harness connector and processor — VAF signal output line shorted to ground — Faulty processor o Key off, wait 10 seconds. o Disconnect vehicle harness from vane meter. o Install jumper wire in vane meter vehicle harness connector between VREF and VAF SIGNAL. o Perform Key On Engine Off Self-Test. **NOTE: If no codes are generated, immediately remove jumper and go directly to DK23.** o **Is Code 56 present?**	Yes ▶ No ▶	Replace vane meter. REMOVE jumper wire. RECONNECT vane meter. RERUN Quick Test. REMOVE jumper wire and GO to DK21.
DK21 CHECK VREF AT THE VANE METER		
o Key off, wait 10 seconds. o Harness disconnected from vane meter. o Key on, engine off. o DVOM on 20 volt scale. o Measure voltage at the vane meter vehicle harness connector between VREF and SIGNAL RETURN. o **Is voltage between 4.0 and 6.0 volts?**	Yes ▶ No ▶	GO to DK22. GO to Pinpoint Test Step C1.

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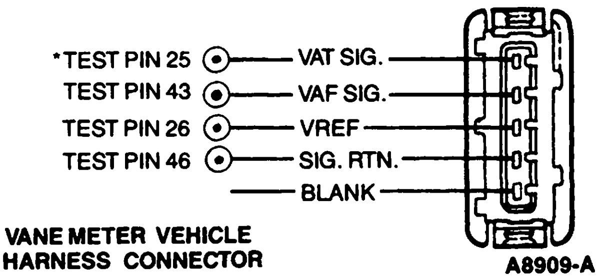
Vane Airflow Sensor (VAF) — Pinpoint Test DK

TEST STEP	RESULT ▶	ACTION TO TAKE
DK22 CHECK CONTINUITY OF VAF SIGNAL		
• Key off, harness disconnected from vane meter. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between VAF SIGNAL, at the vane meter vehicle harness connector, and Test Pin 43 at the breakout box. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to DK23. SERVICE open circuit. REMOVE breakout box. RECONNECT processor and vane meter. RERUN Quick Test.
DK23 CHECK VAF SIGNAL FOR SHORT TO GROUND		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • Harness disconnected from vane meter. • DVOM on 200,000 ohm scale. • Measure resistance at the vane meter vehicle harness between VAF SIGNAL and SIGNAL RETURN and between VAF SIGNAL and negative battery terminal. • **Are both resistances greater than 10,000 ohms?** 	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT processor and vane meter. RERUN Quick Test. SERVICE circuit shorts. RECONNECT vane meter. RERUN Quick Test.

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Vane Airflow Sensor (VAF)

Pinpoint Test DK

TEST STEP	RESULT ▶	ACTION TO TAKE
DK30 SERVICE CODE 76: CHECK FOR VOLTAGE INCREASE IN VAF SIGNAL DURING DYNAMIC RESPONSE		
Service Code 76 indicates that the VAF output voltage did not change enough during the dynamic response test. Possible causes: — Air cleaner duct obstruction — Faulty vane meter — Faulty processor o Key off, wait 10 seconds. o Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o Install breakout box and connect processor to breakout box. o DVOM on 20 volt scale. o Connect DVOM to Test Pins 43 and 46. o Perform Engine Running Quick Test while monitoring DVOM. o After dynamic response prompt Code 1(0) operator moves throttle briefly to WOT and back. DVOM should increase more than 2.0 volts from reading before WOT. o Observe service codes at end of test. o **Did voltage increase more than 2.0 volts?**	Yes ▶ No ▶	GO to DK31 . CHECK air cleaner duct for obstruction. If OK, REPLACE vane meter.
DK31 CHECK SERVICE CODES FROM STEP DK 30		
o Observe Engine Running service codes outputted in Pinpoint Test Step DK30 . o **Is Code 76 present?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RERUN Quick Test. Vane meter is OK, SERVICE other codes as necessary.

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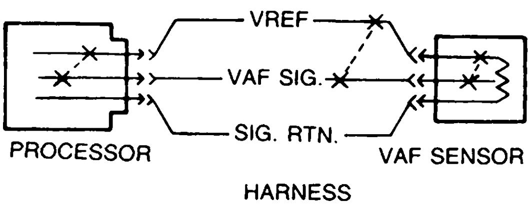
Vane Airflow Sensor (VAF) — Pinpoint Test DK

TEST STEP	RESULT ▶	ACTION TO TAKE
DK90 CONTINUOUS MEMORY CODE 56: CHECK VAF SENSOR		
Continous Memory Code 56 indicates that the vane airflow (VAF) sensor signal was greater than the Self-Test maximum value of 4.89 volts. The code was set during normal driving conditions. Possible causes: — Faulty vane meter — Faulty vane meter harness connectors and/or terminals — Faulty processor harness connector and/or terminals • Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: — Lightly tap on VAF sensor (simulate road shock). — Wiggle VAF connector. — **Is a fault indicated?**	Yes ▶	DISCONNECT and INSPECT connectors. If connector and terminals are good, REPLACE VAF sensor. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.
	No ▶	GO to DK91 .



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Vane Airflow Sensor (VAF) — Pinpoint Test DK

TEST STEP	RESULT ▶	ACTION TO TAKE
DK91 CHECK EEC-IV HARNESS		
○ Still in Key On Engine Off Continuous Monitor mode. ○ Observe VOM or STAR LED for a fault indication while performing the following: — Referring to the illustration in Step DK90, grasp the harness close to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV harness from the dash panel to the processor. ○ **Is a fault indicated?**	Yes ▶	ISOLATE fault and SERVICE as necessary. REFER to appropriate figure. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.
	No ▶	GO to DK92.
DK92 CHECK PROCESSOR AND HARNESS CONNECTORS		
○ Key off, wait 10 seconds. ○ Disconnect processor 60 pin connector. Inspect both connectors and connector terminals for obvious damage or faults. ○ **Are connectors and terminals OK?**	Yes ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.
	No ▶	SERVICE as necessary. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.

* Can be purchased as a separate item.

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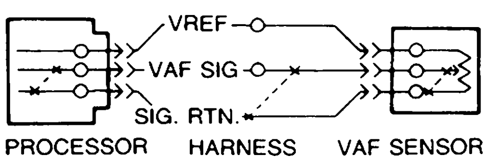
Vane Airflow Sensor (VAF)

Pinpoint Test DK

TEST STEP	RESULT ▶	ACTION TO TAKE
DK93 CONTINUOUS MEMORY CODE 66: CHECK VAF SENSOR		
Continuous Memory Code 66 indicates that the vane airflow (VAF) sensor signal was less than the Self-Test minimum of 0.17 volts. The code was set during normal driving conditions. Possible causes: — Faulty vane meter harness — Faulty vane meter — Faulty processor assembly • Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: — Lightly tap on VAF sensor (simulate road shock). — Wiggle VAF connector. • **Is a fault indicated?**	Yes ▶	DISCONNECT and INSPECT connectors. If connector and terminals are good, CLEAR Continuous Memory. REFER to Quick Test Appendix. REPLACE sensor. RERUN Quick Test.
	No ▶	GO to DK94 .



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Vane Airflow Sensor (VAF) | Pinpoint Test | DK

TEST STEP	RESULT ▶	ACTION TO TAKE
DK94 CHECK EEC-IV HARNESS		
• Still in Key On Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: — Referring to the illustration in Step DK93, grasp the harness close to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV harness from the dash panel to the processor. • **Is a fault indicated?**	Yes ▶	ISOLATE fault and SERVICE as necessary. REFER to appropriate figure. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.
	No ▶	GO to DK95.
DK95 CHECK PROCESSOR AND HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. • Inspect both connectors and connector terminals for obvious damage or faults. • **Are connectors and terminals OK?**	No ▶	SERVICE as necessary. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.
	Yes ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.

* Can be purchased as a separate item.

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR)

Pinpoint Test DL

Note

You should enter this Pinpoint Test only when a Service Code 31, 32, 33, 34, 35 or 84 is received in Quick Test Step 3.0, 5.0 or 6.0.

Remember

To prevent the replacement of good components, be aware that the following non-EEC area may be at fault:

- Damaged EGR valve
- Restricted exhaust system
- Damaged vacuum reservoir or canister

This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: VREF, PFE, SIGNAL RETURN, EVR, VPWR.
- PFE sensor (-9D460-)
- EVR solenoid (-9J459-)
- EGR valve assembly
- Processor assembly (-12A650-)
- Vacuum lines/tubes (EVR, PFE)

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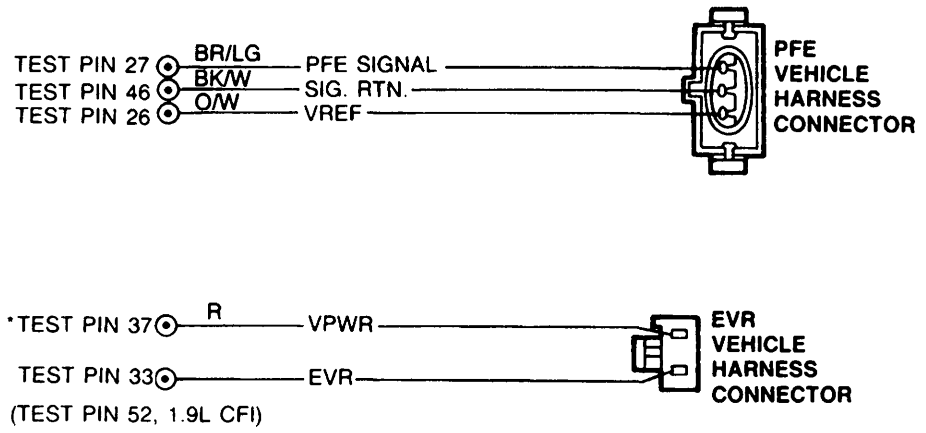
Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR)

Pinpoint Test | **DL**

Pinpoint Test Schematic



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9596-D

Test Pin 33 (52) **EVR**

Application	Wire Color
1.9L CFI 2.3L HSC EFI	Y
3.0L EFI 3.8L AXOD SEFI 3.8L RWD SEFI	DG

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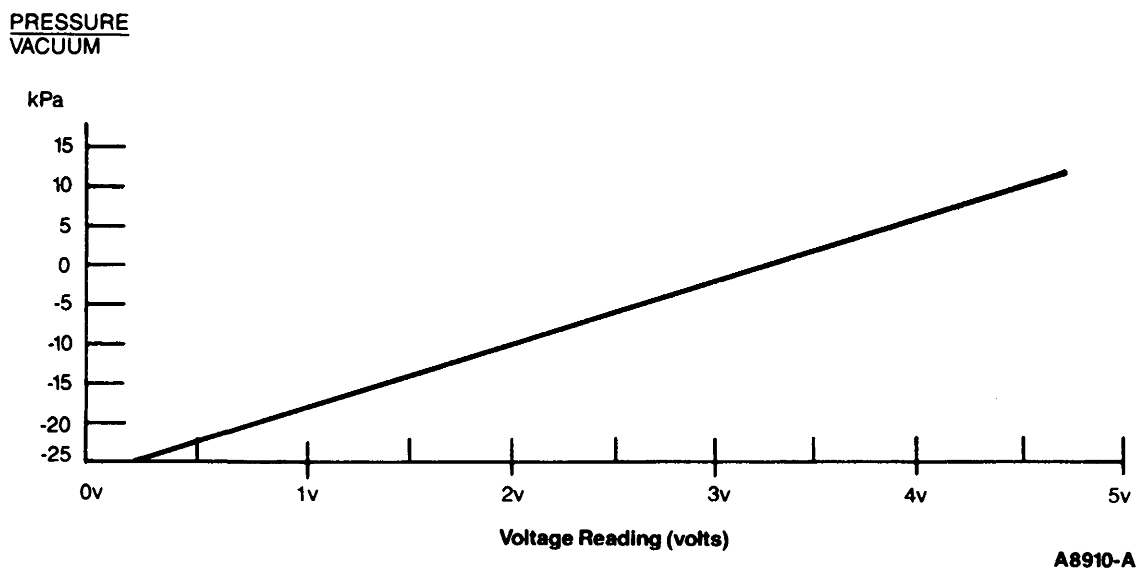
Pinpoint Test DL

NOTE: Voltage values calculated for VREF = 5.0 volts. These values may vary ±15 percent due to sensor and VREF variations.

PFE Sensor Graph



PFE Sensor Data

Pressure/Vacuum			
PSI	**in-Hg**	**kPa**	**Voltage**
1.82	—	12.5	4.75
1.36	—	9.42	4.38
0.91	—	6.25	4.0
0.46	—	3.17	3.63
0	0	0	3.25
—	5	-17	1.22
—	7.4	-25	0.25
CAUTION: To avoid possible sensor damage do not exceed pressure/vacuum range shown when testing.			

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR) | Pinpoint Test | DL

TEST STEP	RESULT ▶	ACTION TO TAKE
DL1 SERVICE CODE 31: INDUCE CODE 35		
Service Code 31 indicates that the Pressure Feedback EGR (PFE) sensor signal is less than the Self-Test minimum value of 0.2 volts. Possible causes are: — Faulty PFE sensor — Open harness — Shorted harness — Faulty processor o Key off. o Disconnect PFE vehicle harness at sensor. o Jumper VREF to PFE SIGNAL at vehicle harness sensor connector. o Perform Key On Engine Off Self-Test. **NOTE: If no codes are generated, immediately remove jumper and go directly to Step DL4 .** o **Is Code 35 present?** **NOTE: Ignore all other codes at this time.**	Yes ▶ No ▶	REMOVE Jumper. REPLACE PFE sensor. RERUN Quick Test. REMOVE jumper. GO to DL2 .
DL2 MEASURE VREF TO SIGNAL RETURN VOLTAGE		
o Refer to schematic in Pinpoint Test DL. o Key off. o PFE harness disconnected. o DVOM on 20 volt scale. o Key on, engine off. o Measure voltage at PFE vehicle harness connector between VREF and SIGNAL RETURN. o **Is voltage between 4 and 6 volts?**	Yes ▶ No ▶	GO to DL3 . GO to Pinpoint Test Step C1 .
DL3 CHECK CONTINUITY OF PFE SIGNAL		
o Key off. o PFE harness disconnected. o DVOM on 200 ohm scale. o Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o Install breakout box, leave processor disconnected. o Measure resistance between PFE SIGNAL at vehicle harness sensor connector and Test Pin 27 at the breakout box. o **Is resistance greater than 5 ohms?**	Yes ▶ No ▶	SERVICE open circuit. RECONNECT PFE sensor. REMOVE breakout box. RERUN Quick Test. GO to DL4 .

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR) | Pinpoint Test | DL

TEST STEP	RESULT ▶	ACTION TO TAKE
DL4 CHECK RESISTANCE OF PFE SIGNAL TO GROUND AND SIGNAL RETURN		
• Key off. • PFE harness disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between PFE SIGNAL at PFE vehicle harness connector and ground. • Measure resistance between PFE SIGNAL at the PFE vehicle harness connector and Test Pin 46 at the breakout box. • **Are both resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. RECONNECT PFE sensor. REMOVE breakout box. RERUN Quick Test. SERVICE short circuit. RECONNECT PFE. REMOVE breakout box. RERUN Quick Test.
DL5 SERVICE CODE 35: INDUCE CODE 31		
Service Code 35 indicates that the Pressure Feedback EGR (PFE) sensor signal is greater than the Self-Test maximum value of 4.8 volts. Possible causes are: — Faulty PFE sensor — Shorted harness — Faulty processor • Key off. • Disconnect PFE vehicle harness at sensor. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Rerun Key On Engine Off Self-Test. • **Is Code 31 present?** **NOTE: Ignore all other codes at this time.**	Yes ▶ No ▶	GO to DL6 . GO to DL7 .
DL6 MEASURE VREF TO SIGNAL RETURN VOLTAGE		
• Refer to schematic in Pinpoint Test DL. • Key off. • PFE harness disconnected. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage at PFE vehicle harness connector between VREF and SIGNAL RETURN. • **Is voltage between 4 and 6 volts?**	Yes ▶ No ▶	REPLACE PFE sensor. RERUN Quick Test. GO to Pinpoint Test Step C1 .

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR) — Pinpoint Test DL

TEST STEP	RESULT ▶	ACTION TO TAKE
DL7 CHECK PFE CIRCUIT FOR SHORT TO POWER		
• Key off. • PFE harness disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure the resistance between Test Pin 27 and Test Pins 26, 37 and 57 at the breakout box. • **Are both resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT PFE sensor. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT PFE sensor. RERUN Quick Test.
DL8 SERVICE CODE 34: PFE SENSOR OUT OF RANGE		
Service Code 34 indicates that the Pressure Feedback EGR (PFE) sensor is out of Self-Test range and that the PFE sensor is probably defective. Correct range of measurement is 2.6 to 4.2 volts. Possible causes are: — Faulty PFE sensor — Obstructed pressure feed tube — Garage exhaust ventilation system deflecting PFE sensor • PFE system can sense a lack of pressure in the vehicle exhaust system. An efficient garage exhaust ventilation system installed during Key On Engine Off Self-Test, may deflect the PFE sensor and generate a Code 34. Remove garage forced ventilation system and properly vent to atmosphere. • Rerun Key On Engine Off Self-Test. • **Is Code 34 present?**	Yes ▶ No ▶	GO to DL9. ADDRESS any other codes in Key On, Engine Off. If none, CONTINUE with remaining Quick Test.
DL9 CHECK PRESSURE FEED TUBE TO PFE SENSOR		
• Remove the pressure feed tube from PFE sensor. • Inspect complete tube, including PFE inlet for blockage. • **Is blockage present?**	Yes ▶ No ▶	SERVICE as necessary. RERUN Quick Test. GO to DL10.

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR)

Pinpoint Test **DL**

TEST STEP	RESULT ▶	ACTION TO TAKE
DL10 MEASURE VREF TO SIGNAL RETURN VOLTAGE		
• Refer to schematic in Pinpoint Test DL. • Key off. • Disconnect PFE sensor. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between VREF and SIGNAL RETURN at PFE vehicle harness connector. • **Is voltage between 4 and 6 volts?**	Yes ▶ No ▶	REPLACE PFE sensor. RERUN Quick Test. GO to Pinpoint Test Step C1 .
DL11 SERVICE CODE 84: MEASURE EVR SOLENOID RESISTANCE		
Service Code 84 indicates a failure in the EGR Vacuum Regulator (EVR) solenoid circuit. Possible causes are: — Faulty EVR solenoid — Open harness — Shorted harness — Faulty processor • Key off. • Disconnect EVR solenoid connector. • DVOM on 200 ohm scale. • Measure solenoid resistance. • **Is resistance between 30 and 70 ohms?**	Yes ▶ No ▶	GO to DL12 . REPLACE EVR solenoid assembly. RERUN Quick Test.
DL12 CHECK FOR VPWR AT EVR SOLENOID		
• Key on, engine off. • EVR solenoid disconnected from harness. • DVOM on 20 volt scale. • Measure voltage between battery negative terminal and VPWR circuit at EVR solenoid vehicle harness connector. • **Is voltage less than 10.5 volts?**	Yes ▶ No ▶	SERVICE open circuit. RERUN Quick Test. GO to DL13 .

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR)

Pinpoint Test | **DL**

TEST STEP	RESULT ▶	ACTION TO TAKE
DL13 CHECK CONTINUITY OF EVR CIRCUIT		
• Key off. • EVR solenoid disconnected from harness. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 33 (Test Pin 52, 1.9L CFI) at the breakout box and EVR SIGNAL at the EVR solenoid vehicle harness connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to DL14. SERVICE open circuit. REMOVE breakout box. RECONNECT processor and EVR solenoid. RERUN Quick Test.
DL14 CHECK EVR CIRCUIT FOR SHORT TO POWER OR GROUND		
• Key off. • Breakout box installed, processor disconnected. • EVR solenoid disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 33 (Test Pin 52, 1.9L CFI) and Test Pins 37 and 57 at the breakout box. • Measure resistance between Test Pin 33 (Test Pin 52, 1.9L CFI) and Test Pins 40 and 60 at the breakout box. • **Are any resistances less than 10,000 ohms?**	Yes ▶ No ▶	SERVICE short circuit. REMOVE breakout box. RECONNECT processor and EVR solenoid. RERUN Quick Test. If code is repeated, REPLACE processor. REPLACE processor. REMOVE breakout box. RECONNECT processor and EVR solenoid. RERUN Quick Test.

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR)

Pinpoint Test DL

TEST STEP	RESULT ▶	ACTION TO TAKE
DL20 SERVICE CODE 32: VERIFY ENGINE RUNNING CODES		
Service Code 32 indicates that the EGR valve is not fully seated. Possible causes are: — Obstructed vacuum hose — Contaminated EVR filter — Faulty EGR valve — Faulty EVR solenoid • PFE system can sense a lack of pressure in the vehicle exhaust system. An efficient garage exhaust ventilation system installed during Key On Engine Running Self-Test may, on some calibrations, deflect the PFE sensor and generate a Code 32. Temporarily, remove garage forced ventilation system and properly vent to atmosphere. • Rerun Engine Running Self-Test. • **Is Code 32 present?**	Yes ▶ No ▶	GO to DL21. ADDRESS any other codes in Engine Running. If none, CONTINUE with remaining Self-Test.
DL21 SERVICE CODE 31: ATTEMPT TO SEPARATE EVR FROM PFE		
Service Code 31 indicates that the Pressure Feedback EGR (PFE) sensor signal is less than the self-test minimum. • Key off. • Disconnect EGR valve vacuum line at valve and plug line. • Perform Engine Running Self-Test. • **Is Code 31 or 32 present?**	Yes ▶ No ▶	GO to DL22. GO to DL23.
DL22 CHECK PFE SENSOR SUPPLY TUBE FOR BLOCKAGE		
• Key off. • Check PFE sensor supply tube for obstructions and/or leaks. • **Are there any obstructions or leaks?**	Yes ▶ No ▶	SERVICE as necessary. RECONNECT all lines and RERUN Quick Test. GO to EGR Diagnostics, Section 6.

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR) — Pinpoint Test DL

TEST STEP	RESULT ▶	ACTION TO TAKE
DL23 CHECK EVR FILTER		
o Key off. o Remove and inspect EVR filter for contamination. **NOTE: Blockage of filter will cause vacuum to be applied to EGR valve prematurely.** o **Is filter contaminated?**	Yes ▶ No ▶	REPLACE filter. RECONNECT all lines. RERUN Quick Test. REPLACE EVR solenoid. RERUN Quick Test.
DL25 SERVICE CODE 34 AND 35: CHECK FOR EXCESSIVE EXHAUST BACK PRESSURE		
Service Codes 34 and 35 indicates that there is excessive exhaust back pressure. Possible causes are: — Restricted exhaust system — Faulty PFE sensor o Key off. o Substitute known good PFE sensor in place of original. o Rerun Engine Running Self-Test. o **Is Code 34 or 35 present?**	Yes ▶ No ▶	GO to Section 5, Catalyst and Exhaust Systems Restricted Exhaust System Diagnosis. Original PFE was the cause of the original Service Code 34 or 35. REPLACE PFE sensor. RERUN Quick Test.
DL30 SERVICE CODE 33: VERIFY VACUUM IS PRESENT AT EGR VALVE		
Service Code 33 indicates that the PFE sensor input did not change after the EVR solenoid was instructed by the processor to open the EGR valve. Possible causes are: — Vacuum hose leaks — Obstructed vacuum hose — Faulty EVR solenoid — Faulty PFE sensor — Faulty EGR valve — Faulty PCV valve (1.9L CFI only) o Key off, wait 10 seconds. o Connect a standard vacuum gauge in-Hg (Mercury) and tee it in at the EGR valve. o Rerun Engine Running Self-Test while observing vacuum gauge. o **Is vacuum reading less than 1 in-Hg throughout the test?** **NOTE: Disregard code output.**	Yes ▶ No ▶	REMOVE vacuum gauge. GO to DL31 . REMOVE vacuum gauge. GO to DL36 .

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR) — Pinpoint Test DL

TEST STEP	RESULT ▶	ACTION TO TAKE
DL31 VACUUM SUPPLY VERIFICATION		
• Key off. • Check the following vacuum hoses for obstructions, cracks or loose connections: — EVR solenoid to EGR valve — EVR solenoid to source — EVR solenoid to PCV valve (1.9L CFI only) • **Are vacuum hoses in good condition?**	Yes ▶ No ▶	1.9L CFI GO to DL32. All others GO to DL34. SERVICE as necessary. RERUN Quick Test.
DL32 SOURCE LINE VACUUM TO EVR VERIFICATION		
• Key off, wait 10 seconds. • Attach vacuum gauge to source line between throttle body and EVR solenoid at the EVR solenoid. • Start engine. • Run engine at approximately 2000 rpm. • **Is vacuum reading greater than 10 in-Hg?**	Yes ▶ No ▶	GO to DL33. REPLACE vacuum line to EVR. REMOVE vacuum gauge. RERUN Quick Test.
DL33 CHECK PCV VALVE FOR OPERATION		
• Key off. • Disconnect vacuum hose at the PCV valve from the EVR solenoid. • Connect a vacuum pump to the PCV valve. • Slowly apply 10 in-Hg vacuum. • **Does the PCV valve open and maintain vacuum?**	Yes ▶ No ▶	REMOVE vacuum gauge. RECONNECT PCV valve. GO to DL35. GO to Section 9 for PCV valve diagnostics.
DL34 VERIFY VACUUM TO EVR		
• Key off, wait 10 seconds. • Attach vacuum gauge to source line from manifold. • Start engine and run at idle. • **Is vacuum present?**	Yes ▶ No ▶	GO to DL35. REPLACE vacuum line to EVR. RERUN Quick Test.

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR) — Pinpoint Test DL

TEST STEP	RESULT ▶	ACTION TO TAKE
DL35 INSPECT EGR VALVE FOR OPERATION		
∘ Key off. ∘ Disconnect vacuum hose at the EGR valve. ∘ Connect a vacuum pump to the EGR valve. ∘ While observing the EGR valve, slowly apply 10 in-Hg vacuum. ∘ **Does the EGR valve move freely and smoothly?** **NOTE: EGR valve should begin to open with a very small amount of vacuum, approximately 1 to 1.5 in-Hg and be fully open with about 4 in-Hg vacuum.**	Yes ▶	CHECK EVR solenoid filter for obstructions. REPLACE as necessary. If OK, REPLACE EVR solenoid assembly. REMOVE vacuum pump. RECONNECT EGR valve. RERUN Quick Test.
	No ▶	GO to Section 6 for EGR valve diagnostics.
DL36 CHECK PFE SENSOR SUPPLY TUBE FOR BLOCKAGE		
∘ Key off. ∘ **Is control pressure input tube to PFE sensor cracked, disconnected or obstructed?**	Yes ▶	SERVICE as necessary. RERUN Quick Test.
	No ▶	GO to DL37 .

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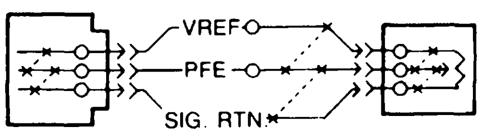
Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR)

Pinpoint Test **DL**

TEST STEP	RESULT ▶	ACTION TO TAKE
DL37 SUBSTITUTE KNOWN GOOD PFE SENSOR		
• Key off, wait 10 seconds. • Substitute known good PFE sensor in place of original. • Rerun Engine Running Self-Test. • **Is Code 33 present?**	Yes ▶	GO to Section 6 for EGR valve diagnostics.
	No ▶	Original PFE was the cause of the original Service Code 33. REPLACE PFE sensor. RERUN Quick Test.
DL90 CONTINUOUS MEMORY CODE 31 OR 35: EXERCISE PFE SENSOR		
Continuous Memory Codes 31 and 35 indicate that the Pressure Feedback EGR (PFE) sensor signal went either less than (Code 31) or greater than (Code 35) the self-test voltage sometime during vehicle operation. Possible causes are: — Damaged connectors and/or terminals — Open or grounded harness — Faulty PFE sensor • Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: • Connect a vacuum pump to the PFE sensor. • Slowly apply 5 in-Hg to the sensor. • Slowly bleed vacuum off the PFE sensor. • Lightly tap on PFE sensor (to simulate road shock). • Wiggle PFE connector. • **Is fault indicated?**	Yes ▶	DISCONNECT and INSPECT connectors. If connector and terminals are good, REPLACE PFE sensor. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.
	No ▶	GO to DL91.



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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR) | Pinpoint Test | DL

TEST STEP	RESULT ▶	ACTION TO TAKE
DL91 CHECK EEC-IV HARNESS		
• Still in Key On Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: — Referring to the illustration in Step DL90 grasp the harness closest to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV harness from the dash panel to the processor. • **Is a fault indicated?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test. GO to DL92 .
DL92 CHECK PROCESSOR AND HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. • Inspect both connectors and connector terminals for obvious damage or faults. • **Are connectors and terminals OK?**	Yes ▶ No ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix. SERVICE as necessary. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.

* Can be purchased as a separate item.

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR) | Pinpoint Test | DL

TEST STEP		RESULT ▶	ACTION TO TAKE
DL93	CONTINUOUS MEMORY CODE 34: INSPECT PFE SUPPLY TUBE FOR BLOCKAGE		
Continuous Memory Code 34 indicates that at sometime during vehicle operation, the PFE sensor experienced a restriction. • Key off. • Remove PFE sensor and inspect sensor supply inlet for liquids and/or any type of blockage. • Inspect PFE supply tube to EGR valve base for liquids and/or blockage. • **Is supply tube free of any blockage?**		Yes ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.
		No ▶	CLEAN and/or SERVICE as necessary. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.
DL94	CONTINUOUS MEMORY CODE 32: INSPECT EGR VALVE FOR SMOOTH OPERATION.		
Continuous Memory Code 32 indicates that when called for during vehicle operation the EGR valve did not seat itself fully. Possible causes are: — Obstructed vacuum hose — Contaminated EVR filter — Faulty EGR valve • Key off. • Connect a vacuum pump to the EGR valve. • Apply 10 in-Hg of vacuum to EGR valve. • While observing EGR valve, release vacuum. • **Does EGR valve function in a smooth manner?** **NOTE: Repeat test if necessary to ensure accurate result.**		Yes ▶	GO to $\boxed{\text{DL95}}$.
		No ▶	CLEAR Continuous Memory. REFER to Quick Test Appendix. GO to EGR Valve Diagnostics, Section 6.

* Can be purchased as a separate item.

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR) | Pinpoint Test | DL

TEST STEP	RESULT ▶	ACTION TO TAKE
DL95 INSPECT VACUUM LINES BETWEEN EVR SOLENOID AND EGR VALVE		
• Inspect EGR valve vacuum supply line from EVR solenoid for kinks and/or obstructions. • **Is vacuum supply line to EGR valve free of any obstructions?**	Yes ▶	GO to DL96 .
	No ▶	SERVICE as necessary. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.
DL96 EVR SOLENOID FILTER INSPECTION		
• Carefully check EVR filter for contamination and/or obstructions. • **Is EVR filter condition acceptable?**	Yes ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.
	No ▶	REPLACE EVR filter. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR)

Pinpoint Test **DL**

TEST STEP	RESULT ▶	ACTION TO TAKE
DL97 CONTINUOUS MEMORY CODE 33: INSPECT EGR VALVE FOR FREE OPERATION		
Continuous Memory Code 33 indicates that the EGR valve intermittently did not open when it was required to. Possible causes are: — Faulty EGR valve — Open or shorted harness • Key off. • Connect a vacuum pump to the EGR valve. • While observing the EGR valve, slowly apply 10 in-Hg vacuum. **NOTE: EGR valve should begin to open with a very small amount of vacuum, approximately 1 to 1.5 in-Hg, and be fully open with about 4 in-Hg vacuum.** • **Does EGR valve move freely and smoothly?**	Yes ▶ No ▶	GO to DL98 . CLEAR Continuous Memory. REFER to Quick Test Appendix. GO to EGR Valve Diagnostics, Section 6.
DL98 EVR HARNESS CHECK		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • Enter Output State Check. Refer to Quick Test Appendix. • DVOM on 20 volt scale. • Connect DVOM negative test lead to Test Pin 40 at the breakout box and DVOM positive test lead to Test Pin 33. (Test Pin 52 for 1.9L CFI). • Cycle throttle if necessary to indicate greater than 10.5 volts. • Remain at this position. • While observing DVOM, grasp the harness closest to the EVR connector. Wiggle, shake or bend a small section of the EEC-IV system harness while working your way to the dash panel. • Lightly tap EVR solenoid to simulate road shock. • **Does DVOM indicate less than 10.5 volts?**	Yes ▶ No ▶	SERVICE as necessary. REMOVE breakout box. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test. REMOVE breakout box. Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.

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EGR Valve Position Sensor (EVP) EGR Vacuum Regulator Solenoid (EVR)

Pinpoint Test

DN

Note

You should enter this Pinpoint Test only when a Service Code 31, 32, 33, 34, 35, 38 or 84 is received in Quick Test Step 3.0, 5.0 or 6.0 or from Pinpoint Test Step S3.

Remember

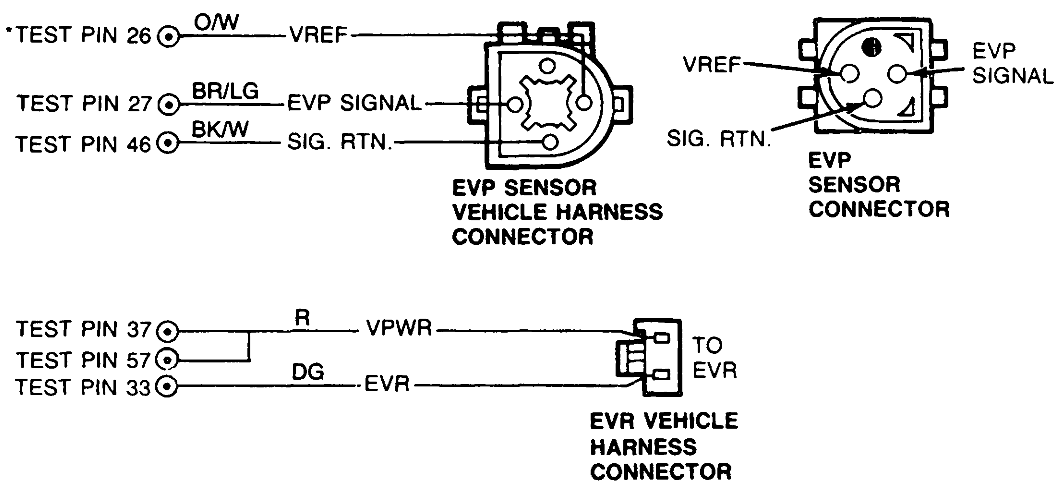
To prevent the replacement of good components, be aware that the following non-EEC area may be at fault:

- Damaged EGR valve

This Pinpoint Test is intended to diagnose only the following:

- EVP sensor (-9G428-)
- Harness circuits: VREF, EVP, SIGNAL RETURN, EVR, VPWR
- EVR-EGR Vacuum Regulator (-9J459-)
- EGR valve assembly
- Processor assembly (-12A650-)
- EGR and EVR vacuum lines

Pinpoint Test Schematic



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

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EGR Valve Position Sensor (EVP) EGR Vacuum Regulator Solenoid (EVR) — Pinpoint Test DN

TEST STEP	RESULT ▶	ACTION TO TAKE
DN1 SERVICE CODE 31: ATTEMPT TO GENERATE CODE 35		
Service Code 31 indicates that the EGR Valve Position sensor (EVP) signal is less than the Self-Test minimum value of 0.2 volts. Possible causes are: — Faulty EVP sensor — Open harness — Grounded harness — Faulty processor • Key off, wait 10 seconds. • Disconnect EVP vehicle harness at sensor. • Jumper VREF to EVP signal at vehicle harness connector. • Rerun Key On Engine Off Self-Test. • **Is Code 35 present?** **NOTE: Ignore all other codes at this time.**	Yes ▶	REMOVE Jumper. REPLACE EVP sensor. RERUN Quick Test.
	No ▶	REMOVE jumper. GO to DN2 .
DN2 CHECK VREF TO SIGNAL RETURN VOLTAGE		
• Key on, engine off. • EVP disconnected from harness. • DVOM on 20 volt scale. • Measure voltage between VREF and SIGNAL RETURN at EVP vehicle harness connector. • **Is voltage between 4.0 and 6.0 volts?**	Yes ▶	GO to DN3 .
	No ▶	GO to Pinpoint Test Step C1 .
DN3 CHECK CONTINUITY OF EVP SIGNAL		
• Key off, wait 10 seconds. • EVP sensor disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • DVOM on 200 ohm scale. • Measure resistance between EVP SIGNAL at vehicle harness connector and Test Pin 27 at the breakout box. • **Is resistance less than 5 ohms?**	Yes ▶	GO to DN4 .
	No ▶	SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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EGR Valve Position Sensor (EVP) EGR Vacuum Regulator Solenoid (EVR)

Pinpoint Test DN

TEST STEP	RESULT ▶	ACTION TO TAKE
DN4 CHECK EVP SIGNAL FOR SHORT TO GROUND		
o Key off. o EVP harness disconnected. o Breakout box installed. o Disconnect processor. o DVOM on 200,000 ohm scale. o Measure resistance between Test Pin 27 and Test Pins 40, 46 and 60 at the breakout box. o **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
DN5 SERVICE CODE 35: ATTEMPT TO GENERATE CODE 31		
Service Code 35 indicates that the EGR Valve Position sensor (EVP) signal is greater than the Self-Test maximum value of 4.81 volts. Possible causes are: — Faulty EVP sensor — Short to power in harness o Key off, wait 10 seconds. o Disconnect EVP sensor. o Rerun Key On Engine Off Self-Test. o **Is Code 31 present?** **NOTE: Ignore all other codes at this time.**	Yes ▶ No ▶	GO to DN6 . GO to DN7 .
DN6 CHECK VREF TO SIGNAL RETURN VOLTAGE		
o Key on, engine off. o EVP sensor disconnected. o DVOM on 20 volt scale. o Measure voltage between VREF and SIGNAL RETURN at EVP vehicle harness connector. o **Is voltage between 4.0 and 6.0 volts?**	Yes ▶ No ▶	REPLACE EVP sensor. RERUN Quick Test. GO to Pinpoint Test Step C1 .

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EGR Valve Position Sensor (EVP) EGR Vacuum Regulator Solenoid (EVR) — Pinpoint Test DN

TEST STEP	RESULT ▶	ACTION TO TAKE
DN7 CHECK EVP SIGNAL FOR SHORT TO POWER		
• Key off. • EVP disconnected from harness. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure the resistance between Test Pin 27 and Test Pins 26 and 57 at the breakout box. • **Are both resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT EVP sensor. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box, RECONNECT EVP sensor and processor. RERUN Quick Test.
DN10 SERVICE CODE 84: CHECK RESISTANCE OF EVR SOLENOID		
Service Code 84 indicates a failure in the EGR Vacuum Regulator solenoid (EVR) circuit. Possible causes are: — Faulty EVR solenoid — Open harness — Shorted harness — Faulty processor • Key off, wait 10 seconds. • Disconnect EVR solenoid. • DVOM on 200 ohm scale. • Measure solenoid resistance. • **Is resistance between 30 and 70 ohms?**	Yes ▶ No ▶	GO to DN11. REPLACE EVR solenoid assembly. RERUN Quick Test.
DN11 CHECK FOR VPWR AT EVR SOLENOID		
• Key on, engine off. • EVR solenoid disconnected. • DVOM on 20 volt scale. • Measure voltage between battery negative post and VPWR circuit at the EVR solenoid vehicle harness connector. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to DN12. RECONNECT EVR solenoid. SERVICE open circuit. RERUN Quick Test.

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EGR Valve Position Sensor (EVP) EGR Vacuum Regulator Solenoid (EVR) — Pinpoint Test — DN

TEST STEP	RESULT ▶	ACTION TO TAKE
DN12 CHECK CONTINUITY OF EVR CIRCUIT		
• Key off. • EVR solenoid disconnected from harness. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 33 at the breakout box and EVR SIGNAL at the EVR solenoid vehicle harness connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to DN13. SERVICE open circuit. REMOVE breakout box. RECONNECT processor and EVR solenoid. RERUN Quick Test.
DN13 CHECK EVR CIRCUIT FOR SHORT TO POWER AND GROUND		
• Key off. • EVR solenoid disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 33 and Test Pins 37/57, 40/60 and 46 at the breakout box. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT processor and EVR solenoid. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT processor and EVR solenoid. RERUN Quick Test. If code is repeated, REPLACE processor.

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EGR Valve Position Sensor (EVP) EGR Vacuum Regulator Solenoid (EVR)

Pinpoint Test DN

TEST STEP	RESULT ▶	ACTION TO TAKE
DN20 SERVICE CODE 34: CHECK FOR SERVICE CODE 84		
Service Code 34 in Key On Engine Off indicates that the EGR valve and/or EGR Valve Position sensor (EVP) is not fully seated in the closed position. The EVP voltage is greater than the closed limit voltage of 0.67 volts. Because of the preload on the installed EVP sensor, it is very difficult to determine whether the EGR valve is seated or the EVP sensor is in contact with the EGR valve stem. Possible causes are: — Poor continuity at EVP sensor — Non-seated EGR valve — Faulty EGR valve — Faulty EVP sensor • Key off, wait 10 seconds • **Is Code 84 present in Key On Engine Off Self-Test?**	Yes ▶ No ▶	GO to DN10. GO to DN21.
DN21 FUNCTIONAL CHECK OF EVP SENSOR AND EGR VALVE		
• Key off, wait 10 seconds. • Disconnect EVP sensor. • Inspect both the connector on harness and sensor for damaged pins, corrosion, loose wires, etc. Service as necessary. • Remove vacuum line from EGR valve. • Exercise EGR valve by either applying and releasing vacuum with a vacuum pump or depressing releasing the diaphragm manually. • Reconnect vacuum line to EGR valve and electrical connector to EVP sensor. • Rerun Key On Engine Off and Engine Running Self-Test. • **Is Code 34 still present?**	Yes ▶ No ▶	GO to DN22. The original Code 34 was the result of poor continuity at the EVP signal connector or binding of the EGR valve stem by contaminants. Testing complete.

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EGR Valve Position Sensor (EVP) EGR Vacuum Regulator Solenoid (EVR) — Pinpoint Test DN

TEST STEP	RESULT ▶	ACTION TO TAKE
DN22 SUBSTITUTE EVP SENSOR ON ORIGINAL EGR VALVE		
o Key off, wait 10 seconds. o Install a known good EVP sensor on original EGR valve. o Perform Key On Engine Off Quick Test. o **Is Code 34 still present?**	Yes ▶ No ▶	GO to EGR Valve Diagnostics, Section 6. The original Code 34 was the result of the original EVP sensor. SERVICE EVP sensor as necessary. RERUN Quick Test.
DN25 SERVICE CODE 32: FUNCTIONAL CHECK OF EVP SENSOR AND EGR VALVE		
Service Code 32 in Key On Engine Off and Key On Engine Running indicates that the EGR valve and/or EVP sensor is lower than normal in the closed position. The EVP voltage is less than the closed limit voltage of 0.29 volts. Because of the preload of the EVP sensor it is very difficult to determine whether the EGR valve has malfunctioned or the EVP sensor has an abnormally high resistance. Possible causes are: — Poor continuity at EVP connector — Non-seated EGR valve — Faulty EGR valve — Faulty EVP sensor o Key off, wait 10 seconds. o Disconnect EVP sensor. o Inspect both the connector at harness and sensor for damaged pins, corrosion, loose wires, etc. Service as necessary. o Remove vacuum line from EGR valve. o Exercise EGR valve by either applying and releasing vacuum with a vacuum pump or depressing releasing the diaphragm manually. o Reconnect vacuum line to EGR valve and electrical connector to EVP sensor. o Rerun Key On Engine Off and Engine Running Self-Test. • **Is Code 32 still present?**	Yes ▶ No ▶	GO to DN26 . The original Code 32 was the result of a poor continuity at the EVP signal connector or binding of the EGR valve stem by contaminants. Testing complete.

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EGR Valve Position Sensor (EVP) EGR Vacuum Regulator Solenoid (EVR)

Pinpoint Test **DN**

TEST STEP	RESULT ▶	ACTION TO TAKE
DN26 SUBSTITUTE EVP SENSOR ON ORIGINAL EGR VALVE		
• Key off, wait 10 seconds. • Install a known good EVP sensor on original EGR valve. • Rerun Key On Engine Off Self-Test. • **Is Code 32 present?**	Yes ▶	GO to Section 6 for EGR valve diagnostics.
	No ▶	The original Code 32 was the result of the original EVP sensor. SERVICE EVP sensor as necessary. RERUN Quick Test.
DN40 SERVICE CODE 33: VERIFY VACUUM IS PRESENT AT EGR VALVE		
Service Code 33 in Key On Engine Running indicates that the EVP sensor input did not change after the EVR solenoid was instructed by the processor to open the EGR valve. Because a Code 84 was not received in the Key On Engine Off Self-Test, it is known that the EVR solenoid functions electrically. It is also known that the EVP sensor is in the expected closed valve range because Code 32 and 34 were not received in either Key On Engine Off or Key On Engine Running Tests. Possible causes are: — Vacuum hose leaks — Obstructed vacuum hose — Obstructed EVR solenoid filter — Faulty EGR valve • Key off. • Disconnect vacuum line from EGR valve. • Connect vacuum gauge at open vacuum line. • Rerun Engine Running Self-Test while observing vacuum gauge. • **Is vacuum greater than 1.5 in-Hg (5 kPa)?**	Yes ▶	REMOVE vacuum gauge. GO to DN43.
	No ▶	REMOVE vacuum gauge. RECONNECT EGR valve. GO to DN41.
DN41 VERIFY VACUUM SUPPLY TO EVR SOLENOID		
• Key off. • Disconnect the vacuum source to the EVR solenoid. • Install a vacuum gauge at source vacuum. • Start engine and check vacuum. • **Is vacuum greater than 10 in-Hg (33 kPa)?**	Yes ▶	GO to DN42.
	No ▶	CHECK source vacuum hose to EVR solenoid. SERVICE as necessary. RERUN Quick Test.

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EGR Valve Position Sensor (EVP) EGR Vacuum Regulator Solenoid (EVR) — Pinpoint Test — DN

TEST STEP	RESULT ▶	ACTION TO TAKE
DN42 CHECK VACUUM HOSE BETWEEN EVR SOLENOID AND EGR VALVE		
• Carefully check EGR vacuum hose from EGR valve to EVR for obstructions cracks, loose connectors, blockage, kinks and leaks, etc. • **Is vacuum hose in good condition?**	Yes ▶	CHECK EVR solenoid filter for obstructions. REPLACE as necessary. If OK, REPLACE EVR solenoid assembly. RECONNECT vacuum hose. RERUN Quick Test.
	No ▶	SERVICE vacuum hose as necessary. RERUN Quick Test.
DN43 FUNCTIONAL CHECK OF EVP SENSOR AND EGR VALVE		
• Key off, wait 10 seconds. • Disconnect EVP sensor. • Inspect both the connector on harness and EVP sensor for damaged pins, corrosion, loose wires, etc. Service as necessary. • EGR valve vacuum disconnected. • Exercise EGR valve by depressing and releasing the diaphragm manually. • Reconnect vacuum line to EGR valve and electrical connector to EVP sensor. • Rerun Key On Engine Off and Engine Running Self-Test. • **Is Code 33 still present?**	Yes ▶	GO to DN44.
	No ▶	The original Code 33 was the result of poor continuity at the EVP signal connector or binding of the EGR valve stem by contaminants. Testing complete.
DN44 VERIFY EGR VALVE VACUUM CONTROL		
• Key off. • EGR valve vacuum disconnected. • Connect vacuum gauge to EGR valve, and apply 2 to 3 in-Hg (6.7 to 10 kPa) for 2 minutes. • **Does EGR valve hold vacuum?**	Yes ▶	RECONNECT EGR valve (vacuum), GO to DN45.
	No ▶	GO to Section 6 for EGR valve diagnostics.

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EGR Valve Position Sensor (EVP) EGR Vacuum Regulator Solenoid (EVR) — Pinpoint Test DN

TEST STEP		RESULT ▶	ACTION TO TAKE
DN45	SUBSTITUTE KNOWN GOOD EVP SENSOR ON ORIGINAL EGR VALVE		
	• Key off, wait 10 seconds. • Install a known good EVP sensor on original EGR valve. • Rerun Engine Running Self-Test. • **Is Code 33 present?**	Yes ▶	GO to Section 6 for EGR valve diagnostics.
		No ▶	The original Code 33 was the result of the original EVP sensor. SERVICE EVP sensor as necessary. RERUN Quick Test.
DN50	SERVICE CODE 34: EGR VALVE OPERATION, ENGINE RUNNING SELF-TEST WITH EGR VACUUM DISCONNECTED		
	Service Code 34 in Key On Engine Running indicates that the EVP voltage is greater than the closed limit voltage of 0.67 volts. Possible causes are: — Obstructed EVR solenoid filter — Faulty EVR solenoid — Faulty EGR valve — Faulty EVP sensor • Key off. • Disconnect vacuum hose from EGR valve and plug hose. • Rerun Engine Running Self-Test. • **Is Code 34 present?**	Yes ▶	GO to DN51.
		No ▶	CHECK EVR filter for obstructions. REPLACE as necessary. If OK, REPLACE EVR solenoid assembly. RECONNECT all vacuum hoses. RERUN Quick Test.
DN51	CHECK EVP RESISTANCE WHILE APPLYING VACUUM TO EGR VALVE		
	• Key off, wait 10 seconds. • Disconnect harness from EVP sensor. • Disconnect vacuum hose at EGR valve. • Connect vacuum pump to EGR valve. • DVOM on 200,000 ohm scale. • Measure resistance at the EVP sensor between EVP SIGNAL and VREF while increasing vacuum to 10 in-Hg (33 kPa). • Observe resistance as vacuum increases. • **Does resistance decrease gradually from no more than 5,500 ohms to no less than 100 ohms?**	Yes ▶	GO to Section 6 for EGR valve diagnostics.
		No ▶	REPLACE EVP sensor. RECONNECT vacuum hose. RERUN Quick Test.

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EGR Valve Position Sensor (EVP) EGR Vacuum Regulator Solenoid (EVR) | Pinpoint Test | DN

TEST STEP	RESULT ▶	ACTION TO TAKE
DN90 CONTINUOUS MEMORY CODE 32: CHECK EVP SIGNAL VOLTAGE WHILE EXERCISING EVP SENSOR		
NOTE: The EVP circuit indicated that the EGR valve was closed further than normal with the engine at stabilized operating temperature and at idle. • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • Disconnect vacuum hose at EGR valve. • Connect a vacuum pump to the EGR valve. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between Test Pin 27 and Test Pin 46 at the breakout box while doing the following. — Slowly increase vacuum at EGR valve to 6 in-Hg (20 kPa), then slowly bleed vacuum off the EGR valve and lightly tap on EVP sensor (simulate road shock). • **Does voltage drop to less than 0.29 volts?**	Yes ▶	EGR valve may have caused Continuous Memory Code 32. CLEAR Continuous Memory. REFER to Quick Test Appendix. GO to Section 6 for EGR valve diagnostics.
	No ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.

* Can be purchased as a separate item.

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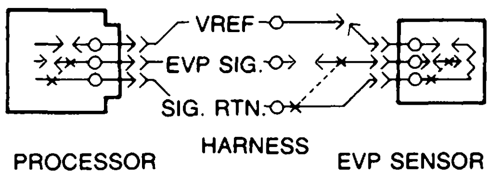
EGR Valve Position Sensor (EVP) EGR Vacuum Regulator Solenoid (EVR) — Pinpoint Test DN

TEST STEP	RESULT ▶	ACTION TO TAKE
DN92 CONTINUOUS MEMORY CODE 31 AND/OR 35: CHECK EEC-IV HARNESS		

NOTE: The EVP circuit indicated an open in the EVP signal or VREF, or a short to SIGNAL RETURN with the engine at stabilized operating temperature and at idle.

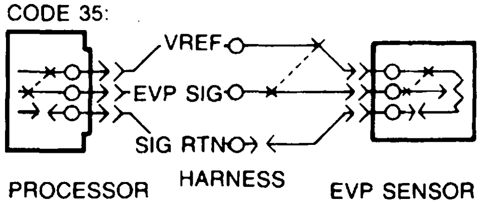
CODE 31:



A9600-C

NOTE: The EVP circuit indicated a short to VREF and/or VPWR, or an open in SIGNAL RETURN with the engine at stabilized operating temperature and at idle.

CODE 35:



A9908-B

- Enter Key On Engine Off Continuous Monitor mode.
- Observe VOM or STAR LED for a fault indication while performing the following:
  - — Refer to illustration above by code for possible circuit faults.
  - — Grasp the harness close to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV harness from the dash panel to the processor.
- **Is a fault indicated?**

RESULT		ACTION TO TAKE
Yes	▶	ISOLATE fault and SERVICE as necessary. REFER to appropriate figure. CLEAR Continuous Memory. REFER to Quick Test Appendix RERUN Quick Test.
No	▶	GO to DN93 .

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EGR Valve Position Sensor (EVP) EGR Vacuum Regulator Solenoid (EVR) — Pinpoint Test DN

TEST STEP	RESULT	ACTION TO TAKE
DN93 CHECK PROCESSOR AND HARNESS CONNECTORS		
∘ Key off, wait 10 seconds. ∘ Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. on both the processor and harness connectors. ∘ **Are connectors and terminals OK?**	Yes ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.
	No ▶	SERVICE as necessary. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.
DN95 CONTINUOUS MEMORY CODE 33: LEAK TEST		
NOTE: The EVP circuit indicated that the EGR valve did not open with the engine at stabilized temperature and with an EVR solenoid duty cycle present. ∘ Key off, wait 10 seconds. ∘ Disconnect vacuum hose at EGR valve. ∘ Connect a vacuum pump to EGR valve. ∘ Apply 20 in-Hg (66 kPa) to EGR valve. ∘ **Does EGR valve open and maintain vacuum?**	Yes ▶	REMOVE vacuum pump. RECONNECT EGR valve. GO to DN96 .
	No ▶	REMOVE vacuum pump. RECONNECT EGR valve. CLEAR Continuous Memory Code 33. REFER to Quick Test Appendix. GO to Section 6 for EGR valve diagnostics.

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EGR Valve Position Sensor (EVP) EGR Vacuum Regulator Solenoid (EVR) — Pinpoint Test DN

TEST STEP	RESULT	ACTION TO TAKE
DN96 EVR CHECK		
• Use Continuous Monitor Mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: — Grasp the harness close to the EVR solenoid connector, wiggle, shake or bend a small section of the harness while working your way to the processor. • Inspect connectors, terminals for obvious damage or faults. • **Are any faults detected?**	Yes ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.
	No ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.
DN98 CONTINUOUS MEMORY CODE 34: CHECK EVP RESISTANCE WHILE APPLYING VACUUM TO EGR VALVE		
NOTE: The EVP circuit indicated that the EGR valve was open with the engine at stabilized operating temperature and at idle. • Key off. • Disconnect harness from EVP sensor. • Disconnect vacuum hose at EGR valve. • Connect vacuum pump to EGR valve. • DVOM on 200,000 ohm scale. • Measure resistance between EVP SIGNAL pin and VREF pin at the EVP sensor while increasing vacuum to 10 in-Hg (33 kPa). • Observe resistance as vacuum increases. • **Does resistance gradually change from no more than 5,500 ohms to no less than 100 ohms as the vacuum increases?**	Yes ▶	REMOVE vacuum pump. RECONNECT EGR valve. CLEAR Continuous Memory Code 34. REFER to Quick Test Appendix. GO to DN99 .
	No ▶	REMOVE vacuum pump. RECONNECT EGR valve. CLEAR Continuous Memory Code 34. REFER to Quick Test Appendix. GO to Section 6 for EGR valve diagnostics.

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EGR Valve Position Sensor (EVP) EGR Vacuum Regulator Solenoid (EVR) — Pinpoint Test DN

TEST STEP	RESULT ▶	ACTION TO TAKE
DN99 EVR CHECK		
• Key off. • Disconnect vacuum hose from EGR valve and plug hose. • Rerun Engine Running Self-Test. • **Is Code 34 present?**	Yes ▶	CHECK EVR filter for obstructions. REPLACE as necessary. If OK, REPLACE EVR solenoid. RECONNECT all vacuum lines. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.
	No ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.

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Vehicle Speed Sensor (VSS) | Pinpoint Test | DP

Note

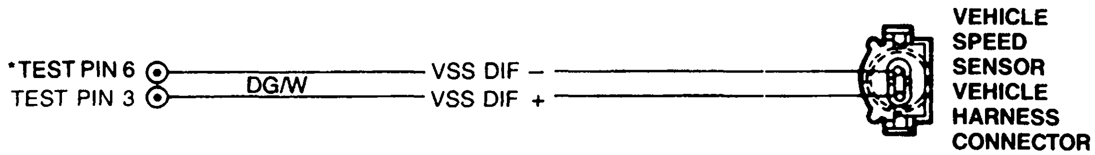
You should enter this Pinpoint Test only when Service Code 29 is received in Quick Test Step 6.0 or when directed here from Quick Test Step 7.0.

Remember

This Pinpoint Test is intended to diagnose only the following:

- VSS Harness Circuits
- Vehicle Speed Sensor (-9E731-)
- Processor Assembly (-12A650-)

Pinpoint Test Schematic



A9909-C

Test Pin 6	VSS DIF -
Application	**Wire Color**
2.3L HSC EFI 2.5L CFI 3.0L SHO SEFI 5.0L SEFI-MA E-Series: 4.9L, 5.0L, 5.8L, 7.3L, 7.5L E4OD	O/Y
2.3L EFI Ranger 2.9L EFI Ranger/Bronco II 3.8L RWD SEFI 3.8L SC SEFI 5.0L SEFI-Crown Victoria, Grand Marquis and Town Car	BK/W
3.0L EFI Aerostar	BK/Y
5.0L SEFI-Mark VII	P/LB
F-Series/Bronco 4.9L, 5.0L, 5.8L, 7.3L, 7.5L E4OD	BK

* TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

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Vehicle Speed Sensor (VSS) | Pinpoint Test | DP

VEHICLE SPEED SENSOR (VSS) DRIVE CYCLE

- Record and clear EEC-IV Continuous Memory Codes.
- Warm engine to operating temperature.
- Perform the drive cycle below as appropriate for the vehicle being tested.

Automatic Transmission

Place the gear selector in LOW and moderately accelerate to 25 mph, then coast down to an idle and stop the vehicle. Shut engine off.

Manual Transmission

Starting in first gear, shift to second gear and moderately accelerate to 40 mph, then coast down to an idle and stop vehicle. Shut engine off.

Run Key On Engine Off Self-Test and record Continuous Memory Codes.

TEST STEP	RESULT ▶	ACTION TO TAKE
DP1 CONTINUOUS MEMORY CODE 29: ATTEMPT TO GENERATE CODE 29		
Continuous Memory Code 29 indicates that there is insufficient input to the processor from the Vehicle Speed Sensor. Possible causes are: — Faulty Vehicle Speed Sensor — Open or shorted circuit — Faulty processor o Perform Vehicle Speed Sensor Drive Cycle, all vehicles except 2.5L CFI and 3.0L EFI Aerostar. o **FOR 2.5L CFI and 3.0L EFI Aerostar, can drive complaint be verified?** o **ALL OTHERS, did Continuous Memory Code 29 repeat?**	Yes ▶ No ▶	GO to DP2 . Unable to duplicate fault symptom at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.

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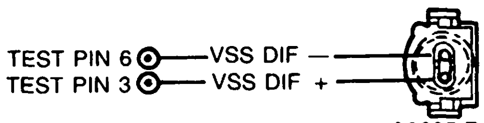
Vehicle Speed Sensor (VSS) | Pinpoint Test | DP

TEST STEP	RESULT ▶	ACTION TO TAKE
DP2 CHECK VEHICLE SPEED SENSOR		
• Key off, wait 10 seconds. • Locate and disconnect Vehicle Speed Sensor. • DVOM on 200,000 ohm scale. • Measure resistance across Vehicle Speed Sensor. • **Is resistance between 190 and 240 ohms?**	Yes ▶ No ▶	GO to DP3 . REPLACE VSS. REPEAT Test Step DP1 , except for 2.5L CFI and 3.0L EFI Aerostar, VERIFY that drive complaint was eliminated.
DP3 CHECK CONTINUITY OF VEHICLE SPEED SENSOR (VSS) HARNESS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box. • Processor and VSS disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 3 at the breakout box and the VSS vehicle harness connector as shown below. • Measure resistance between Test Pin 6 at the breakout box and the VSS vehicle harness connector, as shown below.  A9695-B • **Are both resistances less than 5 ohms?**	Yes ▶ No ▶	GO to DP4 . REMOVE breakout box. RECONNECT processor and VSS. SERVICE open circuit(s). REPEAT Test Step DP1 , except for 2.5L CFI and 3.0L EFI Aerostar. VERIFY that drive complaint was eliminated.

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Vehicle Speed Sensor (VSS)

Pinpoint Test **DP**

TEST STEP		RESULT	ACTION TO TAKE
DP4	CHECK VSS HARNESS FOR SHORTS TO POWER OR GROUND		
	o Key off. o Processor disconnected. o VSS disconnected. o DVOM on 200,000 ohm scale. o Measure resistance between Test Pin 3 and Test Pins 37, 40 and 6 at the breakout box. o Measure resistance between Test Pin 6 and Test Pins 37 at the breakout box. o **Are all resistances greater than 10,000 ohms?**	Yes ▶	REMOVE breakout box. RECONNECT processor. GO to DP5 .
		No ▶	REMOVE breakout box. RECONNECT processor and VSS. SERVICE short circuits(s). REPEAT Test Step DP1 , except for 2.5L CFI and 3.0L EFI Aerostar, VERIFY that drive complaint was eliminated.
DP5	REPEAT VSS DRIVE CYCLE WITH A KNOWN GOOD VSS INSTALLED		
	o Substitute VSS with known good sensor. o Processor and VSS connected. o Perform VSS Drive Cycle (Except 2.5L CFI and 3.0L EFI Aerostar) then return to this Step. o **For 2.5L CFI and 3.0L EFI Aerostar, can drive complaint be verified?** o **All others, did Continuous Memory Code 29 repeat?**	Yes ▶	REMOVE breakout box. REINSTALL original VSS. REPLACE processor. REPEAT Test Step DP1 . Except for 2.5L CFI and 3.0L EFI Aerostar, VERIFY that drive complaint was eliminated.
		No ▶	The original Continuous Memory Code 29 was the result of the original VSS. REPLACE VSS. RERUN Quick Test. (Testing complete for 2.5L CFI and 3.0L EFI Aerostar.)

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Fuel Injection Pump Lever (FIPL) Position Sensor

Pinpoint Test

DQ

Note

You should enter this Pinpoint Test only when a Service Code 23, 53, or 63 is received in Quick Test Step 3.0, 5.0 or 6.0.

Remember

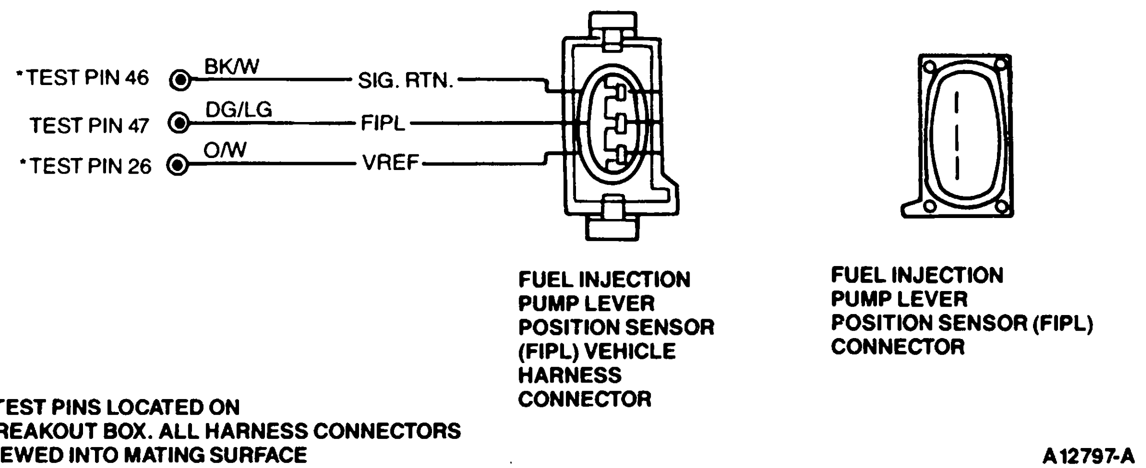
To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Idle speeds/throttle stop adjustment.
- Binding throttle shaft/linkage or speed control linkage.
- Choke/high cam system, if equipped.

This Pinpoint Test is intended to diagnose only the following:

- FIPL sensor (-9B989-)
- Sensor harness circuits: VREF, FIPL SIGNAL, and SIGNAL RETURN
- Processor assembly (-12B565-)

Pinpoint Test Schematic



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Fuel Injection Pump Lever (FIPL) Position Sensor

Pinpoint Test DQ

TEST STEP	RESULT	ACTION TO TAKE
DQ1 SERVICE CODE 23: CHECK FOR STUCK THROTTLE PLATE		
o Visually inspect carburetor/throttle body and throttle linkage for binding or sticking. o Verify the throttle linkage is at mechanical/closed throttle. Check for: binding throttle linkage, speed control linkage, vacuum line/electrical harness interference, etc. o **Does throttle move freely and return to closed throttle position?**	Yes ▶ No ▶	GO to DQ2. SERVICE as necessary. RERUN Quick Test.
DQ2 SERVICE CODE 53: ATTEMPT TO GENERATE CODE 63		
o Refer to schematic. o Key off, wait 10 seconds. o Disconnect FIPL sensor vehicle harness connector at the throttle body. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. o Rerun Key On Engine Off Self-Test. o **Is Code 63 present?** **NOTE: Ignore all other codes at this time.**	Yes ▶ No ▶	GO to DQ3. GO to DQ4.
DQ3 CHECK VOLTAGE VREF TO SIGNAL RETURN		
o Refer to schematic. o Key off, wait 10 seconds. o Disconnect FIPL vehicle harness connector at throttle body. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o DVOM on 20 volt scale. o Key on, engine off. o Measure voltage between VREF and SIGNAL RETURN at the FIPL vehicle harness connector. o **Is voltage between 4.0 and 6.0 volts?**	Yes ▶ No ▶	GO to DQ14 for adjustment procedures on FIPL sensor. GO to Pinpoint Test Step C1.

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Fuel Injection Pump Lever (FIPL) Position Sensor

Pinpoint Test DQ

TEST STEP	RESULT ▶	ACTION TO TAKE
DQ4 CHECK FIPL SIGNAL FOR SHORT TO POWER		
• Key off, wait 10 seconds. • FIPL harness disconnected. • DVOM on 200,000 ohm scale. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wire, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Measure resistance between Test Pin 47 and Test Pins 26 and 57 at the breakout box. • **Are both resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REMOVE breakout box. REPLACE processor. RECONNECT FIPL sensor and processor. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT FIPL sensor and processor. RERUN Quick Test.
DQ10 SERVICE CODE 63: ATTEMPT TO GENERATE CODE 53		
• Key off, wait 10 seconds. • FIPL harness disconnected. • Jumper VREF to FIPL signal at FIPL vehicle harness connector. • Perform Key On Engine Off Self-Test. **NOTE: If no codes are generated, immediately remove jumper and go directly to DQ13.** • **Is Code 53/23 present?** **NOTE: Ignore all other codes at this time.**	Yes ▶ No ▶	REMOVE jumper wire. RECONNECT FIPL sensor. GO to DQ14, for adjustment procedures on FIPL sensor. GO to DQ11.
DQ11 SERVICE CODE 63: CHECK VOLTAGE VREF TO SIGNAL RETURN		
• Refer to schematic. • Key off, wait 10 seconds. • Disconnect FIPL vehicle harness connector at throttle body. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • DVOM on 20 volt scale. • Key on engine off. • Measure voltage between VREF and SIGNAL RETURN at the FIPL vehicle harness connector. • **Is voltage between 4.0 and 6.0 volts?**	Yes ▶ No ▶	GO to DQ12. GO to Pinpoint Test Step C1.

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Fuel Injection Pump Lever (FIPL) Position Sensor

Pinpoint Test DQ

TEST STEP	RESULT ▶	ACTION TO TAKE
DQ12 CHECK CONTINUITY OF FIPL CIRCUIT		
• Key off, wait 10 seconds. • FIPL harness disconnected. • DVOM on 200 ohm scale. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • Measure resistance between FIPL SIGNAL at the vehicle harness connector and Test Pin 47 at the breakout box. • **Is the resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to DQ13 . SERVICE open circuit. RECONNECT harness to sensor. REMOVE breakout box and RERUN Quick Test.
DQ13 CHECK RESISTANCE OF FIPL CIRCUIT TO GROUND/SIGNAL RETURN		
• Key off, wait 10 seconds • FIPL harness disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • DVOM on 200,000 ohm scale. • Measure resistance between FIPL SIGNAL at FIPL vehicle harness connector and Test Pin 46 at the breakout box and between FIPL SIGNAL at FIPL vehicle harness connector and ground. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REMOVE breakout box. REPLACE processor. RECONNECT processor and FIPL sensor. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT processor and FIPL sensor. RERUN Quick Test.

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Fuel Injection Pump Lever (FIPL) Position Sensor

Pinpoint Test **DQ**

DQ14	CHECK FIPL SENSOR ADJUSTMENT

NOTE: Two people are required to perform this procedure.

- Perform Key On Engine Off Self-Test while holding the throttle to wide open (WOT).
- After last service code has been displayed remain in Self-Test.
- While in Self-Test, place 0.515 inch gauge block Rotunda #T83T-7B200-AH between the Max Throttle Travel Screw and the Gauge Boss (Figure 1 and 2).
- Cycle the Overdrive Cancel Switch (OCS) once.
- Observe Self Test Output (STO) of the STAR tester for:
  - — Constant Tone, solid Light, or "STO LO" readout means the FIPL adjustment is within range, cycle OCS to get out of this test.
  - — Beeping Tone, Flashing Light, or "STO LO" erratic readout (4 per second) indicates adjustment is required.
  - — Beeping Tone, Flashing Light, or "STO LO" erratic readout (1 per second) indicates adjustment is required.
- If adjustment is required see Figure 3:

1. If FIPL sensor and bracket screws are tight and there are no signs of wear between the mounted parts, loosen FIPL sensor attachment screws and rotate sensor one way or the other until a constant tone, solid light, or "STO LO" readout is obtained. Tighten FIPL sensor attachment screws. REMOVE gauge block; RERUN Quick Test.
2. If bracket shows signs of wear due to movement or vibration, remove epoxy from FIPL bracket screw heads. Loosen those screws and turn the FIPL/bracket assembly to get within range then retighten screws and apply epoxy to screw head. REMOVE gauge block, RERUN Quick Test.
3. If the Service Codes are still present, REPLACE the FIPL sensor.

WARNING

DO NOT TURN THE MAX THROTTLE TRAVEL SCREW. THIS SCREW HAS BEEN PRESET AND SHOULD NOT BE TAMPERED WITH.

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Fuel Injection Pump Lever (FIPL) Position Sensor

Pinpoint Test

DQ

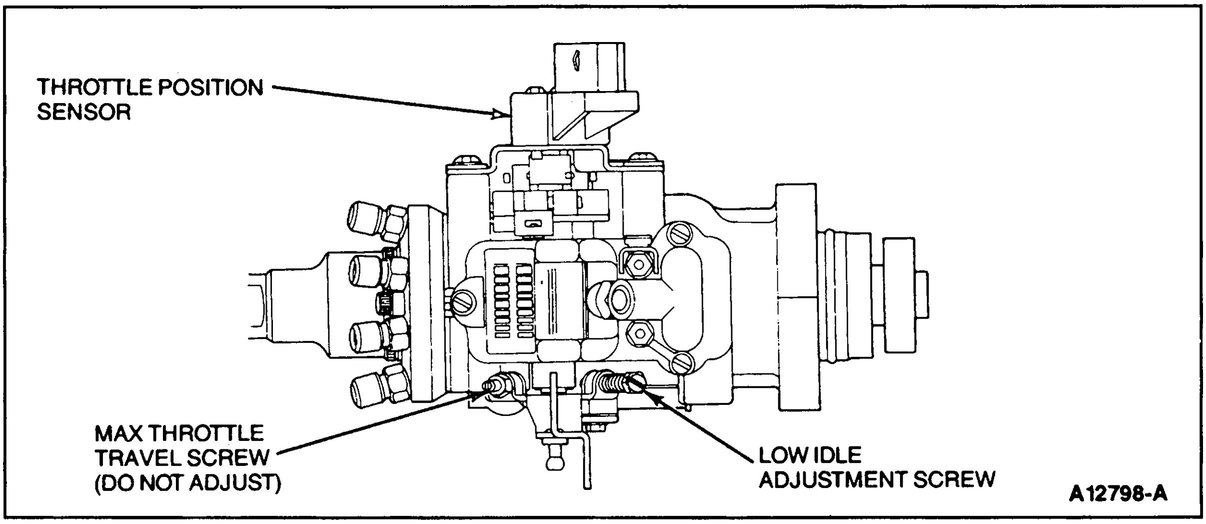

Figure 1 Top View of Fuel Pump

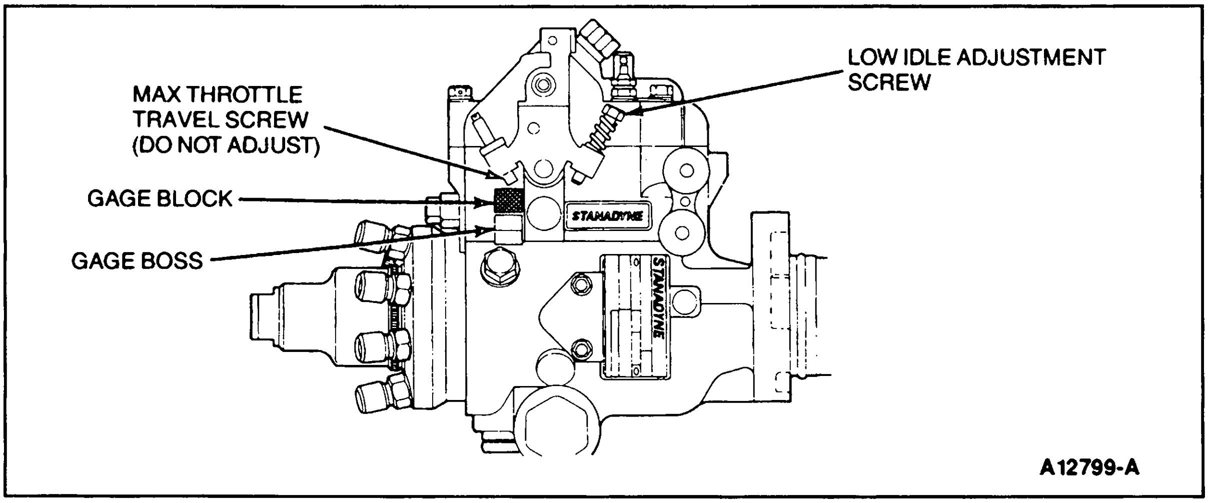

Figure 2 Throttle Side View

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Fuel Injection Pump Lever (FIPL) Position Sensor

Pinpoint Test

DQ

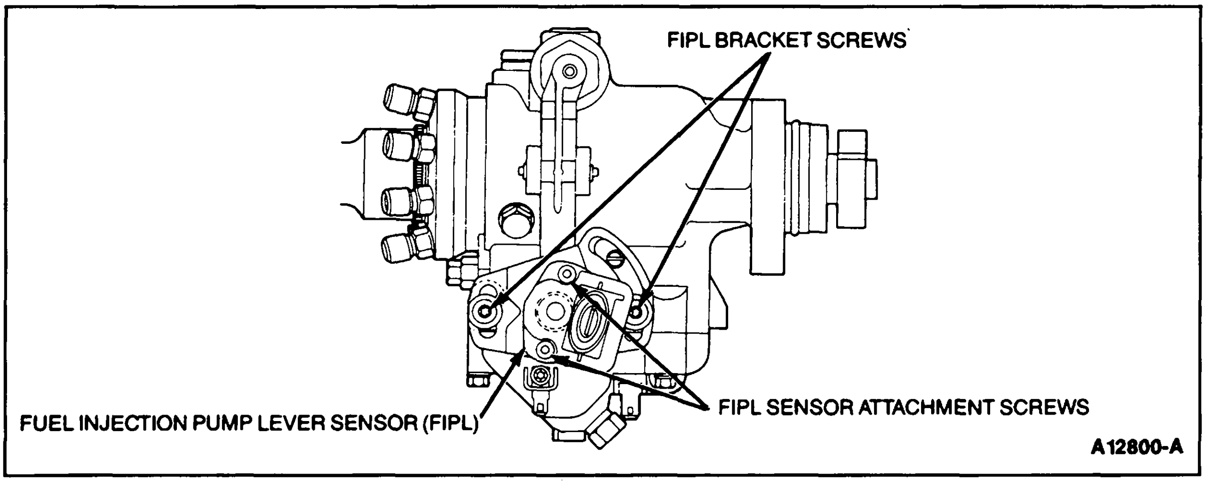

Figure 3 FIPL Side View

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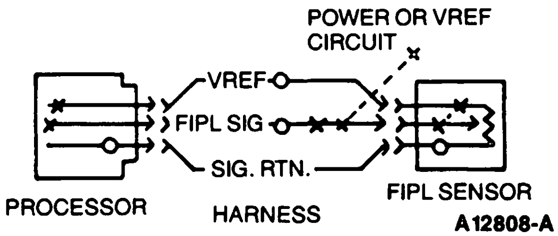
Fuel Injection Pump Lever (FIPL) Position Sensor — Pinpoint Test DQ

TEST STEP		RESULT ▶	ACTION TO TAKE
DQ90	CONTINUOUS MEMORY CODE 53: MONITOR FIPL CIRCUIT UNDER SIMULATED ROAD SHOCK		
	o Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. o Observe VOM or STAR LED for indication of a fault while performing the following: — Move throttle slowly to WOT position. — Release throttle slowly to closed position and lightly tap on FIPL sensor (simulate road shock). — Wiggle FIPL harness connector o **Does VOM or STAR LED indicate a fault?**  	Yes ▶ No ▶	GO to DQ91. GO to DQ92.
DQ91	MEASURE FUEL INJECTION PUMP LEVER POSITION SIGNAL VOLTAGE WHILE EXERCISING FIPL SENSOR		
	o Key off, wait 10 seconds. o Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o Install breakout box and connect processor to breakout box. o VOM or STAR LED still connected to STO as in previous step. o Connect a DVOM from Test Pin 47 to Test Pin 46. o DVOM on 20 volt scale. o Key on engine off. o While observing DVOM, repeat Step DQ90. o **Does the fault occur below 4.25 volts?**	Yes ▶ No ▶	DISCONNECT and INSPECT connectors. If connector and terminals are good, CLEAR Continuous Memory. REFER to Quick Test Appendix. GO to DQ14. VERIFY harness integrity, GO to DQ92.

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Fuel Injection Pump Lever (FIPL) Position Sensor

Pinpoint Test DQ

TEST STEP	RESULT ▶	ACTION TO TAKE
DQ92 CHECK EEC-IV HARNESS		
• Still in Key On Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: — Referring to the illustration in Step DQ90, grasp the harness close to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV harness from the dash panel to the processor. • **Does VOM or STAR LED indicate a fault?**	Yes ▶	ISOLATE fault. SERVICE as necessary. REFER to appropriate figure. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.
	No ▶	GO to DQ93.
DQ93 CHECK PROCESSOR AND HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • **Are connectors and terminals OK?**	Yes ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.
	No ▶	SERVICE as necessary. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.

* Can be purchased as a separate item.

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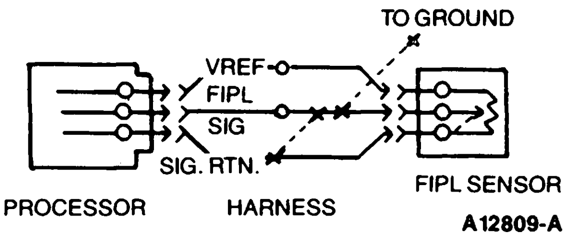
Fuel Injection Pump Lever (FIPL) Position Sensor

Pinpoint Test DQ

TEST STEP	RESULT ▶	ACTION TO TAKE
DQ94 CONTINUOUS MEMORY CODE 63: MONITOR FIPL CIRCUIT UNDER SIMULATED ROAD SHOCK		
• Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: — Move throttle slowly to WOT position. — Release throttle slowly to closed condition. — Lightly tap on FIPL sensor (simulate road shock). — Wiggle FIPL harness connector. • **Does VOM or STAR LED indicate a fault?**  	Yes ▶ No ▶	INSPECT connectors. If connector and terminals are good, CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test. GO to DQ14. GO to DQ95.
DQ95 CHECK EEC-IV HARNESS		
• Still Key On Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: — Referring to the illustration in Step DQ94 grasp the harness close to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV harness from the dash panel to the processor. • **Does VOM or STAR LED indicate a fault?**	Yes ▶ No ▶	ISOLATE fault. SERVICE as necessary. REFER to appropriate figure. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test. GO to DQ96.

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Fuel Injection Pump Lever (FIPL) Position Sensor

Pinpoint Test **DQ**

TEST STEP	RESULT ▶	ACTION TO TAKE
DQ96 CHECK PROCESSOR AND HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. • **Are connectors and terminals OK?**	Yes ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box. REFER to the EEC-IV Monitor box: Intermittent Fault Diagnostics supplement. Section 18* All others. CLEAR Continuous Memory. REFER to Quick Test Appendix.
	No ▶	SERVICE as necessary. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.

* Can be purchased as a separate item.

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Neutral Drive Switch A/C Input — Pinpoint Test FA

Note

You should enter this Pinpoint Test only when a Service Code 67 or 79 is received in Quick Test Step 3.0, 5.0, 6.0, or you have been directed here from Quick Test Step 7.0.

Remember

This Pinpoint Test is intended to diagnose only the following:

- A/C input to processor
- Clutch engage switch (-11A152-)
- Neutral clutch switch (-11A152-)
- Neutral drive switch (-7A247-)
- Neutral gear switch (-7A247-)
- Processor (-12A650-)
- Harness circuits: CES, NCS, NDS, NGS, ACC, ACCS and SIGNAL RETURN

TEST STEP	RESULT ▶	ACTION TO TAKE
FA1 CODE 67 SYSTEM IDENTIFICATION		
A Code 67 resulted from the voltage being high at: — Pin 10 = A/C input — Pin 30 = Neutral drive while cranking the engine or during KOEO test. Possible causes are: — A/C circuit shorted to power — Neutral clutch/drive circuits open — Neutral clutch/drive switch open — Processor faulty		
1.9L CFI M/T, 2.5L M/T, 5.0L EFI TK, 5.8L EFI, 7.5L EFI, and 7.3L Diesel.	▶	GO to FA9.
2.9L M/T TK, 5.0L M/T SEFI	▶	GO to FA2.
1.9L EFI M/T, 2.3L OHC EFI M/T Car and Truck	▶	GO to FA2.
2.3L Turbo M/T	▶	GO to FA6.
3.0L SHO SEFI, 3.8L SC SEFI M/T, 4.9L M/T TK	▶	GO to FA5.
All other systems	▶	GO to FA7.

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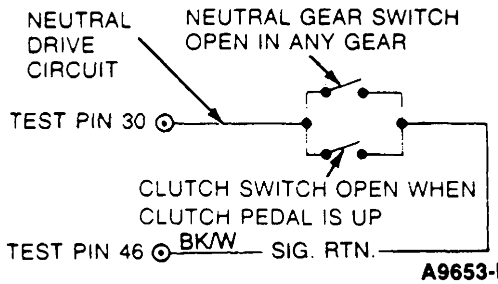
Neutral Drive Switch A/C Input

Pinpoint Test FA

TEST STEP	RESULT ▶	ACTION TO TAKE
FA2 CHECK NEUTRAL GEAR/CLUTCH INPUT		
 A9653-D		
• Key off, wait 10 seconds. • Verify A/C is off, if so equipped. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 30 and Test Pin 46. 1. With transmission in NEUTRAL and clutch up. 2. With transmission in GEAR and clutch down. • **Are both resistances less than 5 ohms?**	Yes ▶ No ▶	Vehicles with A/C GO to **FA9**, all others REPLACE processor. GO to **FA3**.
FA3 CHECK NEUTRAL GEAR/CLUTCH SWITCH		
• Key off. • DVOM on 200 ohm scale. • Breakout box installed, processor disconnected • Locate Neutral Gear switch (on transmission) and Clutch switch (at clutch pedal linkage). • Disconnect vehicle harness at both switches and inspect connectors for pushed back pins. • Measure resistance across the Neutral Gear switch terminals with transmission in NEUTRAL and across the Clutch switch terminals with the clutch pedal down. • **Are both resistances less than 5 ohms?**	Yes ▶ No ▶	GO to **FA4**. REPLACE open switch(es). REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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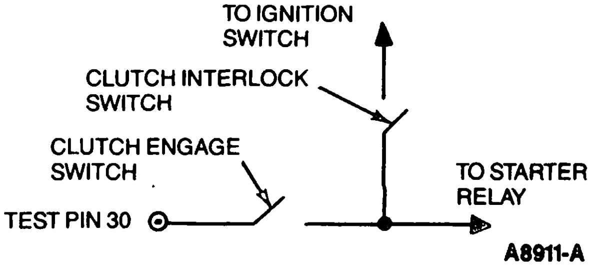
Neutral Drive Switch A/C Input

Pinpoint Test | **FA**

TEST STEP	RESULT ▶	ACTION TO TAKE
FA4 CHECK NEUTRAL GEAR/CLUTCH HARNESS		
∘ Key off. ∘ DVOM on 200 ohm scale. ∘ Breakout box installed, processor disconnected. ∘ Vehicle harness disconnected at the Neutral Gear switch and Clutch switch. ∘ Measure resistance between Test Pin 30 and the Neutral Gear switch harness connector and between Test Pin 30 and the Clutch switch harness connector. ∘ Measure resistance between Test Pin 46 and the Neutral Gear switch harness connector and between Test Pin 46 and the Clutch switch harness connector. ∘ **Are all resistances less than 5 ohms?**	Yes ▶	Vehicles with A/C GO to FA9, all other REPLACE processor.
	No ▶	SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
FA5 CHECK CLUTCH ENGAGE SWITCH		
NOTE: The clutch pedal must be down during KOEO test; if not, a Code 67 will result. ∘ Key off. ∘ Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. ∘ Install breakout box, leave processor disconnected. ∘ DVOM on 200 ohm scale. ∘ Clutch pedal down. ∘ Measure resistance between Test Pin 30 and Test Pin 46. ∘ **Are resistances less than 5 ohms?**	Yes ▶	Vehicles with A/C GO to FA9, all others REPLACE processor.
	No ▶	REMOVE breakout box. RECONNECT all components. SERVICE open circuit.



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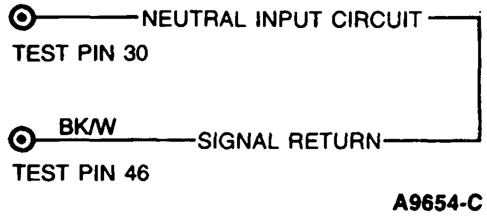
Neutral Drive Switch A/C Input

Pinpoint Test FA

TEST STEP	RESULT ▶	ACTION TO TAKE

FA6 CHECK NEUTRAL INPUT — 2.3L TC M/T

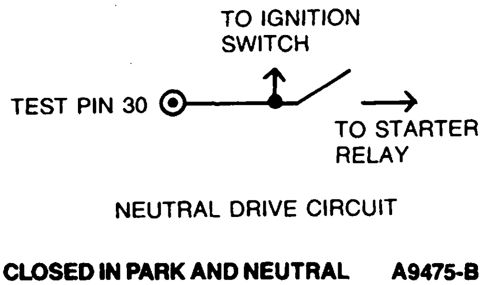


- Key off, wait 10 seconds.
- Verify A/C is off, if so equipped.
- Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary.
- Install breakout box, leave processor disconnected.
- DVOM on 200 ohm scale.
- Measure resistance between Test Pin 30 and Test Pin 46 at the breakout box.
- **Is resistance less than 5 ohms?**

RESULT	ACTION TO TAKE
Yes ▶	Vehicles with A/C GO to FA9 , all others REPLACE processor.
No ▶	REMOVE breakout box. RECONNECT all components. SERVICE open circuit. RERUN Quick Test.

FA7 CHECK NEUTRAL DRIVE INPUT

- Key off, wait 10 seconds.
- Verify heater control is in OFF position, if so equipped.
- Verify transmission is in NEUTRAL or PARK.
- Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary.
- Install breakout box, leave processor connected.
- Key on, engine off.
- DVOM on 20 volt scale.
- Measure voltage between Test Pin 30 at the breakout box and chassis ground.
- **Is voltage less than 1.0 volt?**



RESULT	ACTION TO TAKE
Yes ▶	Vehicles with A/C GO to FA9 , all others REPLACE processor.
No ▶	Go to FA8 .

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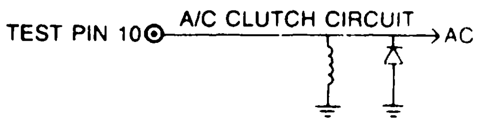
Neutral Drive Switch A/C Input

Pinpoint Test **FA**

TEST STEP	RESULT ▶	ACTION TO TAKE
FA8 CHECK NEUTRAL DRIVE SWITCH		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • DVOM on 200 ohm scale. • Locate the Neutral Drive switch. • Disconnect vehicle harness from the Neutral Drive switch and measure resistance across the switch. • **Is resistance less than 5 ohms?**	Yes ▶	REMOVE breakout box. RECONNECT all components. SERVICE open in vehicle harness Neutral Drive circuit. RERUN Quick Test.
	No ▶	REMOVE breakout box. RECONNECT all components. REPLACE Neutral Drive switch. RERUN Quick Test.
FA9 CHECK A/C INPUT		
NOTE: Before entering this test, verify A/C is off. If A/C was on, rerun Quick Test. If code 67 or 79 is present, continue with this test. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between Test Pin 10 at the breakout box and chassis ground. • **Is voltage greater than 1.0 volt?**	Yes ▶	REMOVE breakout box. RECONNECT all components. SERVICE short to power in A/C clutch circuit. RERUN Quick Test.
	No ▶	For vehicles with E40D transmission, GO to Pinpoint Test Step TC1. All others: REMOVE breakout box. RECONNECT all components. REPLACE processor. RERUN Quick Test.



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Neutral Drive Switch A/C Input

Pinpoint Test FA

TEST STEP	RESULT ▶	ACTION TO TAKE
FA10 CHECK A/C INPUT CIRCUIT		
NOTE: A low idle with A/C on could be the result of the processor not receiving, or recognizing the A/C input on Pin 10. • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 20 volt scale. • Key on, engine off. • A/C on. • Measure voltage between Test Pin 10 and Test Pin 40. • **Is voltage greater than 10.5 volts?**	Yes ▶	REMOVE breakout box. RECONNECT all components. REPLACE processor. RERUN Quick Test.
	No ▶	REMOVE breakout box. RECONNECT all components. SERVICE open in A/C circuit. Refer to the appropriate engine schematic in Engine Supplement Sections. RERUN Quick Test.

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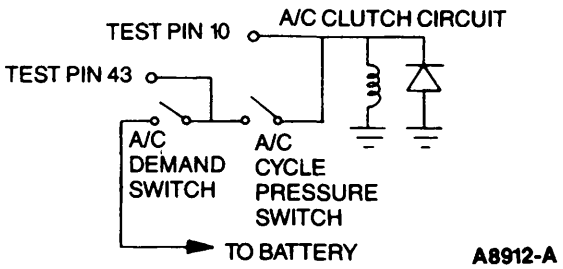
Neutral Drive Switch A/C Input

Pinpoint Test FA

TEST STEP	RESULT ▶	ACTION TO TAKE
FA15 CHECK FOR NONFUNCTION A/C WITH HIGH IDLE		
NOTE: A high idle with A/C instrument panel switch on but A/C not functioning could be the result of no signal at A/C clutch. • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Disconnect A/C clutch connector. • DVOM on 20 volt scale. • Key on, engine off. • A/C on. • Measure voltage between input pin on fan connector and Test Pin 40 at the breakout box. • **Is voltage greater than 10.5 volts?**  	Yes ▶ No ▶	GO to FA16. REMOVE breakout box. RECONNECT all components. SERVICE open in A/C circuit. RERUN Quick Test.
FA16 CHECK CONTINUITY OF A/C CLUTCH		
• Key off. • Breakout box installed, processor disconnected. • A/C clutch disconnected. • DVOM on 200 ohm scale. • Measure the resistance across both pins on the A/C clutch. • **Is resistance between 2.14 and 3.34 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT all components. Fault was probably due to A/C clutch connector not seated. CHECK for damage or loose pins in clutch connector. RERUN Quick Test. REMOVE breakout box. RECONNECT all components. REFER to Truck Shop Manual, Group 36 for A/C clutch service.

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Neutral Drive Switch A/C Input

Pinpoint Test FA

TEST STEP	RESULT ▶	ACTION TO TAKE
FA17 CHECK CONTINUITY OF A/C CYCLE PRESSURE SWITCH CIRCUIT		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • A/C cycle pressure switch disconnected. • A/C demand switch on. • DVOM on 200 ohm scale. • Measure the resistance between Test Pin 43 at the breakout box and battery positive side of the A/C cycle pressure switch connector. • Measure the resistance between Test Pin 10 at the breakout box and negative side of the A/C cycle pressure switch connector. • **Are both resistances less than 5 ohms?**	Yes ▶ No ▶	EEC-IV system OK. REFER to Truck Shop Manual, Group 36 for A/C cycle pressure switch service. SERVICE open circuit. RERUN Quick Test.
FA18 CHECK AC DEMAND/AC CYCLE PRESSURE SWITCH CIRCUIT FOR SHORT TO POWER		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • A/C demand switch off. • DVOM on 20 volt scale. • Key on. • Measure voltage between Test Pin 43 at the breakout box and chassis ground. • **Is voltage greater than 1.0 volts?**	Yes ▶ No ▶	EEC-IV system OK. REFER to Truck Shop Manual, Group 36. REMOVE breakout box. RECONNECT processor. VERIFY operation of A/C demand and A/C cycle pressure switch(s). IF OK, SERVICE short circuit RE-EVALUATE symptom.

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Neutral Drive Switch A/C Input

Pinpoint Test FA

TEST STEP		RESULT ▶	ACTION TO TAKE
FA20	CHECK NDS CIRCUIT FOR SHORT TO GROUND OR CLOSED NEUTRAL DRIVE SWITCH		
	• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnect. • Place transmission in DRIVE. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 30 and Test Pin 40/60 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶	GO to Section 2 for Routine 211, High Idle.
		No ▶	REMOVE breakout box. RECONNECT processor. SERVICE short circuit or closed neutral drive switch. RE-EVALUATE symptom.

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Brake On/Off (BOO)

Pinpoint Test

FD

Note

You should enter this Pinpoint Test only when a Service Code 74 or 75 is received in Quick Test Step 5.0.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

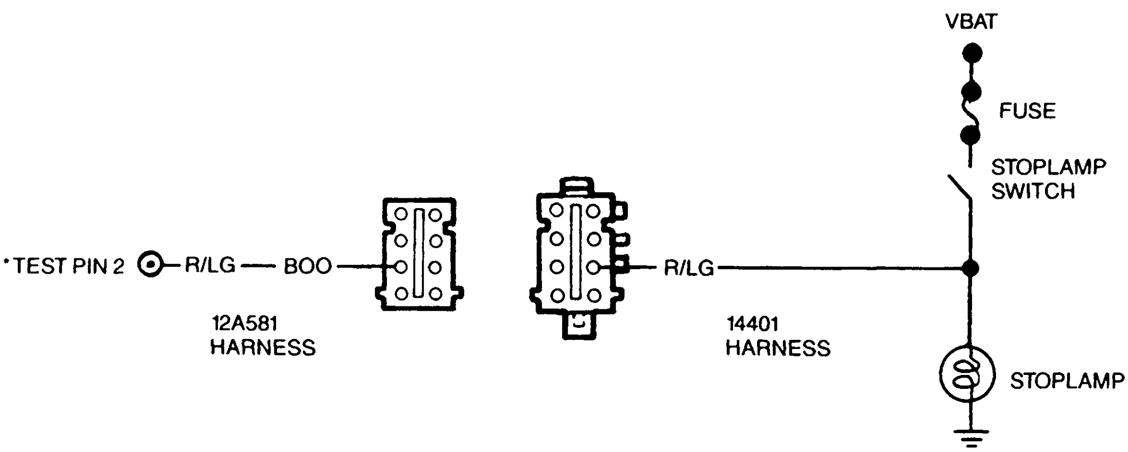
- Brake lamp, Brake switch, and fuse.

This Pinpoint Test is intended to diagnose only the following:

- BOO circuit
- Processor assembly (-12A650-)

Pinpoint Test Schematic

Mustang (2.3L OHC EFI)



A9211-A

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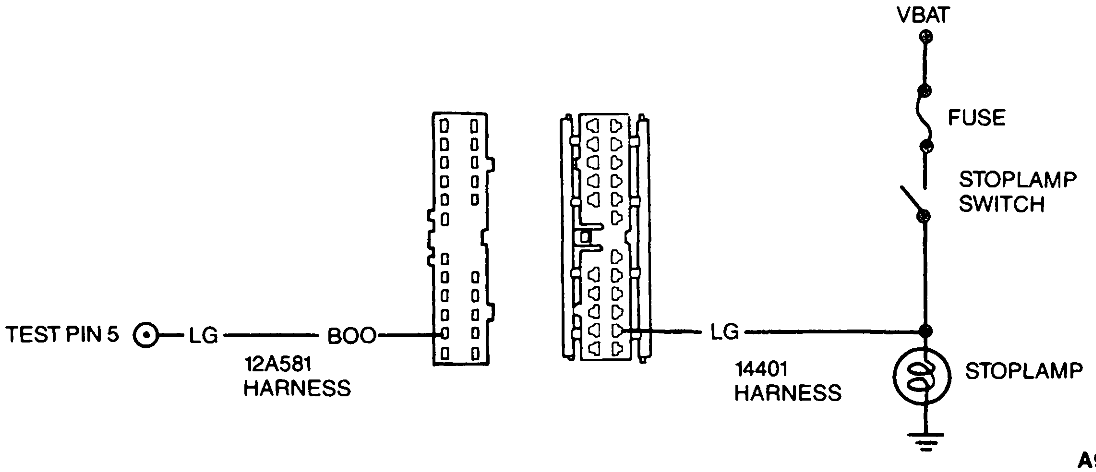
Brake On/Off (BOO)

Pinpoint Test | **FD**

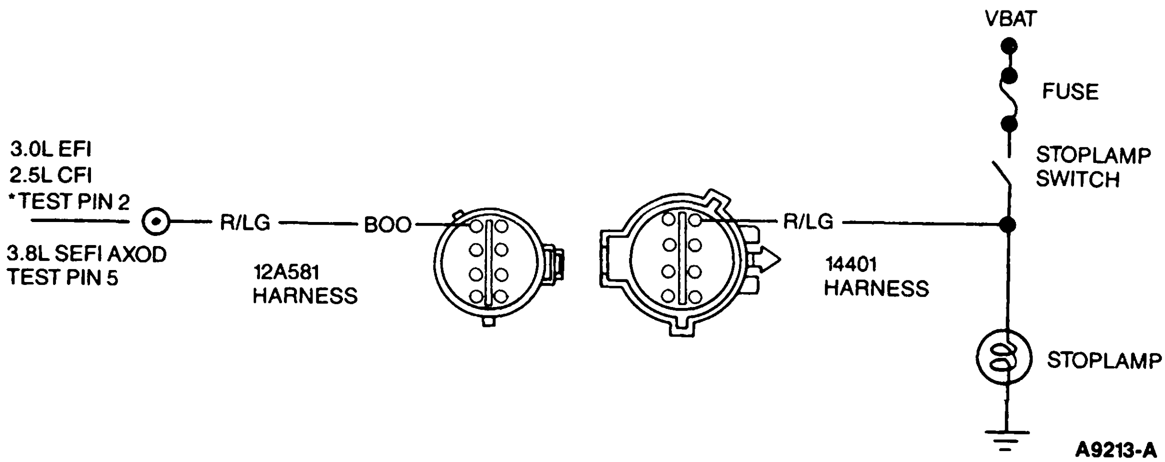
Pinpoint Test Schematic

Thunderbird/Cougar (3.8L SEFI RWD, 3.8L SEFI SC)



A9212-A

Taurus/Sable (2.5L CFI, 3.0L EFI and 3.8L SEFI AXOD)



A9213-A

* **TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACES.

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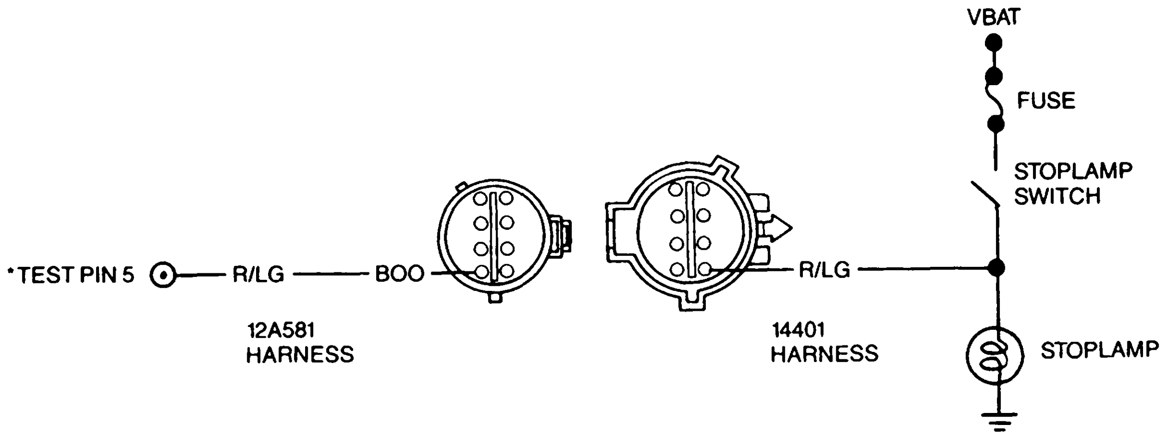
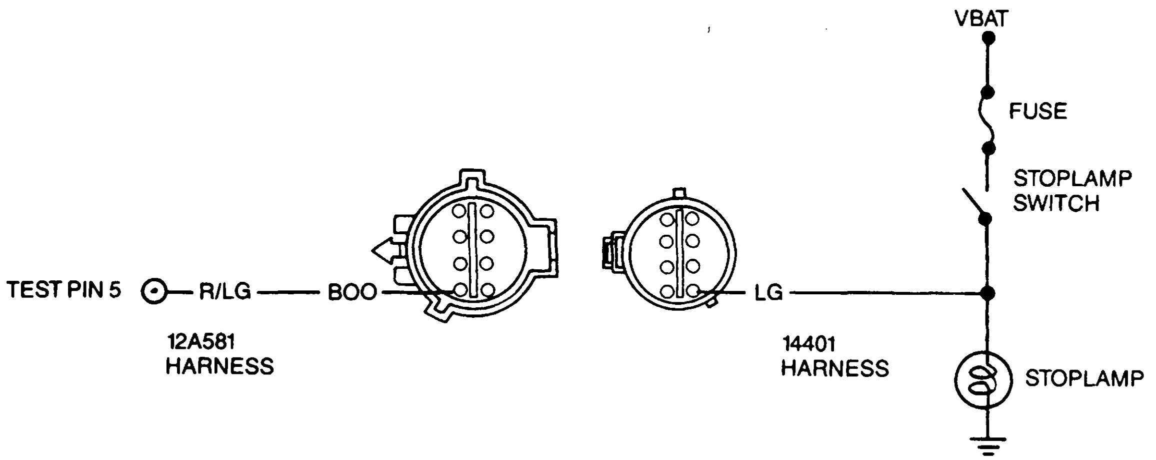
Brake On/Off (BOO) | Pinpoint Test | FD

Taurus/Sable (3.0L SEFI SHO)



A9214-A

Continental (3.8L SEFI AXOD)



A9215-A

*** TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACES.

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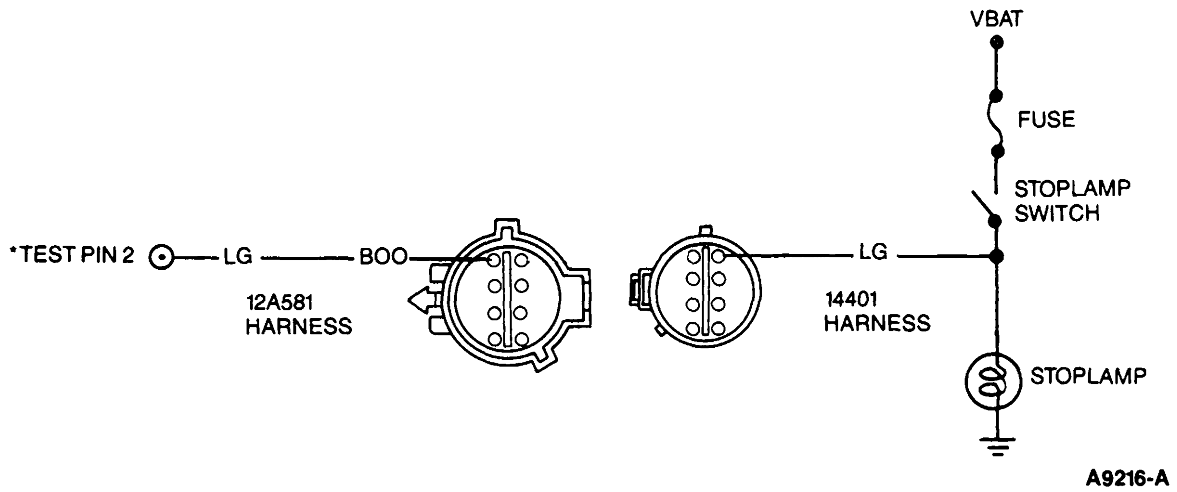
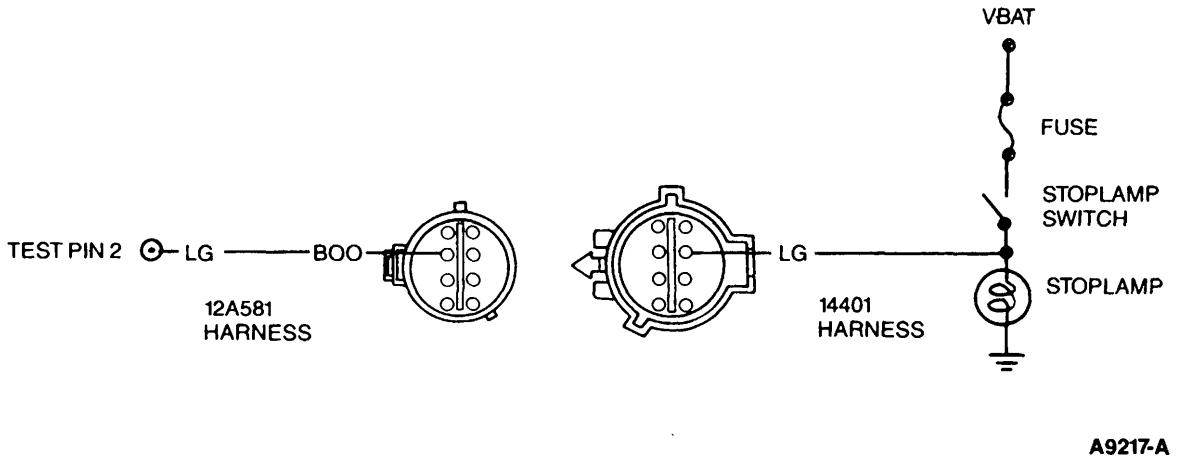
Brake On/Off (BOO) | Pinpoint Test | FD

Crown Victoria/Grand Marquis, Town Car (5.0L SEFI)



Mark VII (5.0L SEFI)



* TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACES.

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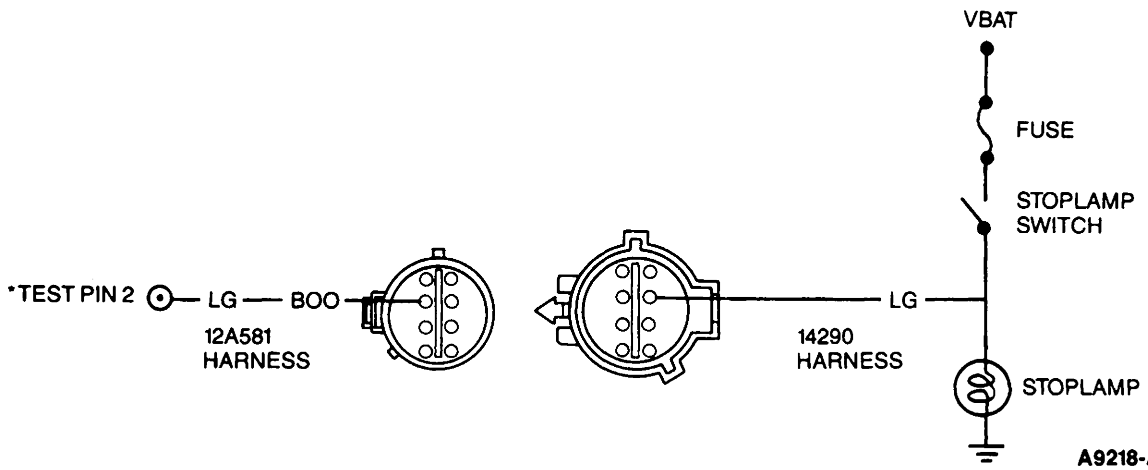
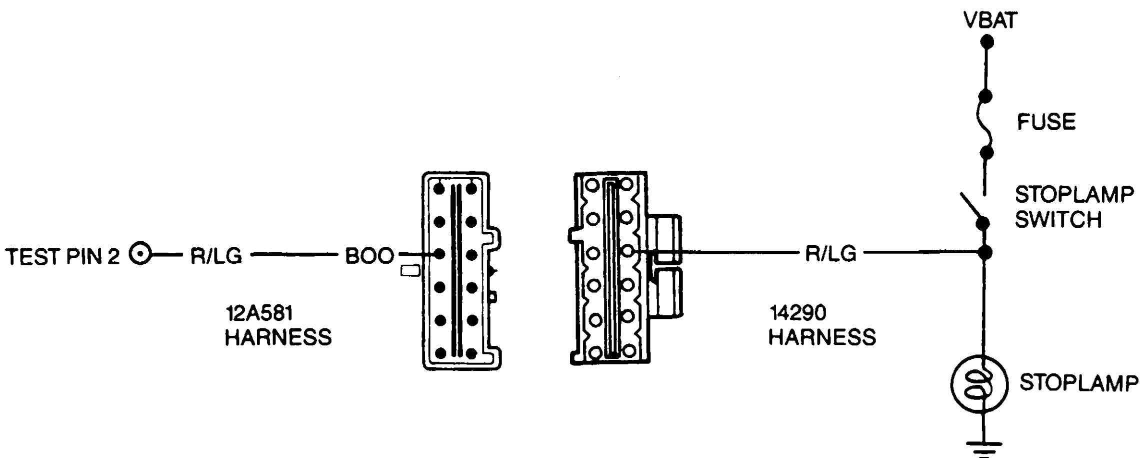
Brake On/Off (BOO)	Pinpoint Test	FD

Bronco II/Ranger (2.3L EFI, 2.9L EFI)



A9218-A

Aerostar (Early Production) (3.0L EFI)



A9219-A

* **TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACES.

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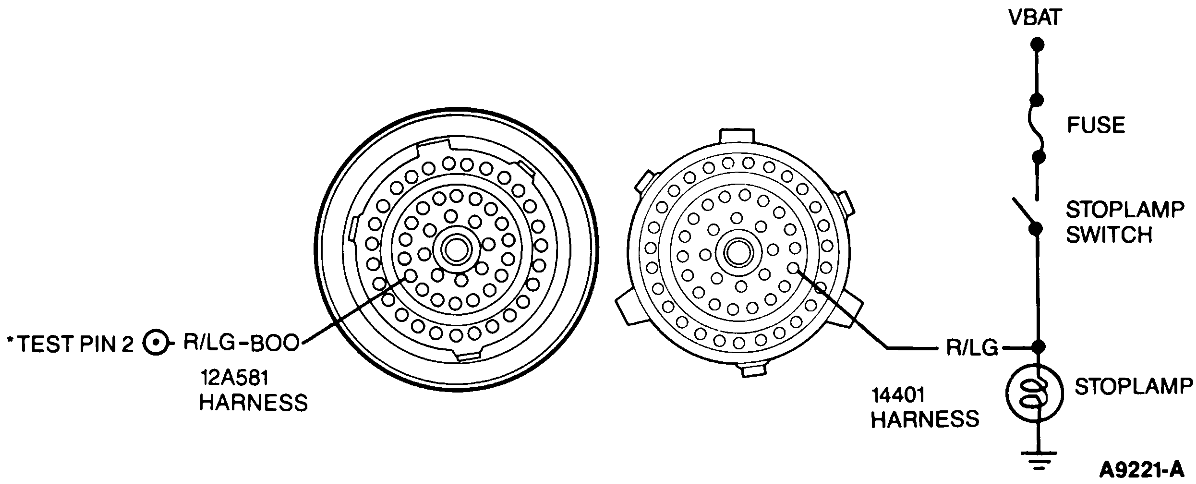
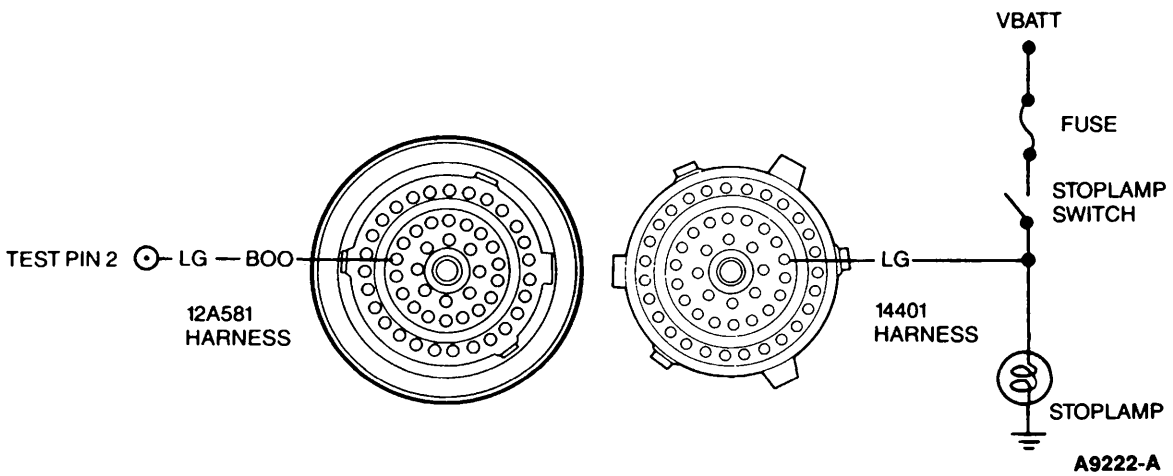
Brake On/Off (BOO) | Pinpoint Test | FD

89 1/4 Aerostar (3.0L EFI)



E-Series E4OD (5.8L EFI, 7.5L EFI, 7.3L Diesel)



* TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACES.

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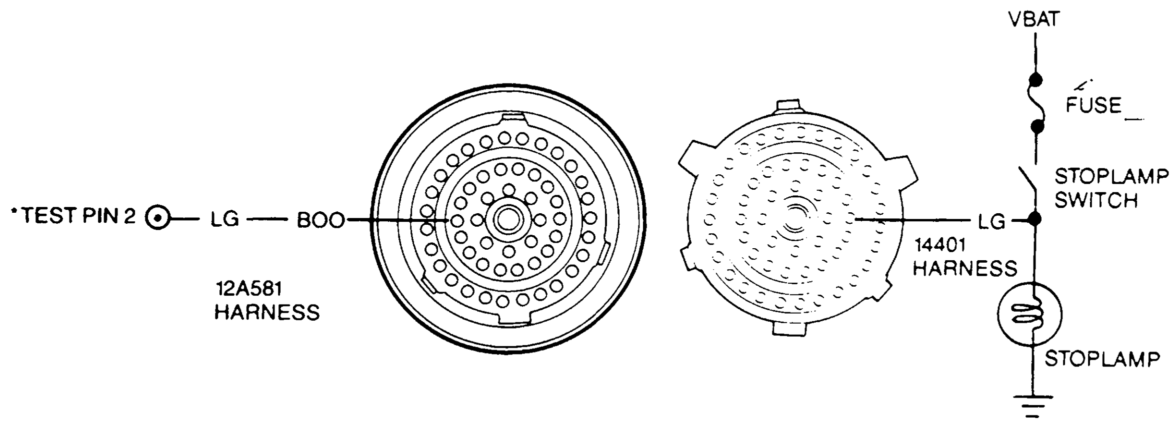
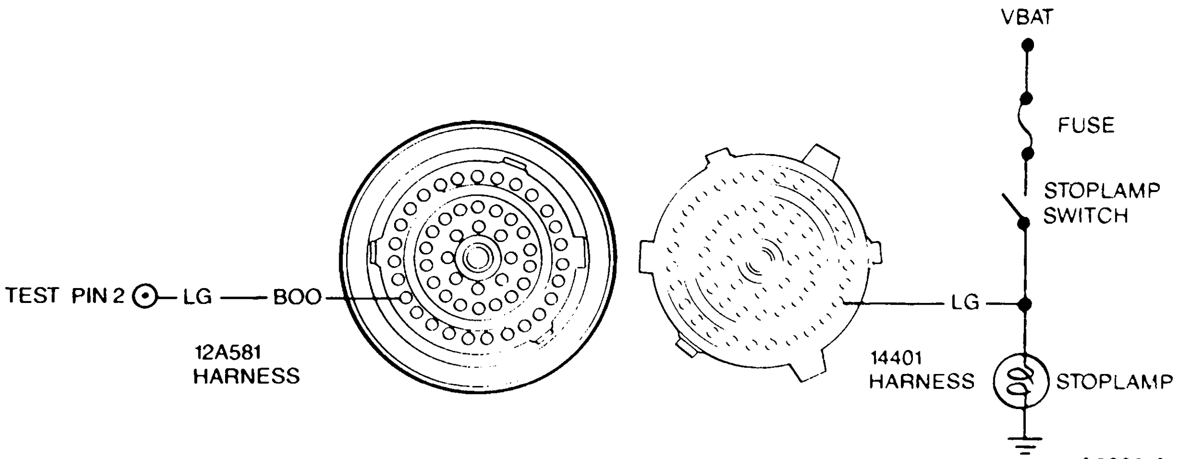
Brake On/Off (BOO) | Pinpoint Test | FD

E-Series E4OD (5.8L EFI, 7.5L EFI)



A9223-A

F-Series E4OD (7.3L Diesel)



A9229-A

* TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACES.

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Brake On/Off (BOO) | Pinpoint Test | FD

TEST STEP	RESULT ▶	ACTION TO TAKE
FD1 SERVICE CODE 74: VERIFY BRAKE WAS PRESSED		
Service Code 74 indicates that when the brake pedal was depressed during the Engine Running Self-Test, the BOO signal did not cycle high. Possible causes are: — Brake pedal not depressed and released during the Engine Running Self-Test — Open stoplamp circuit (VBAT side of BOO splice) — Short to GROUND — Faulty processor o **Did you press brake during the Engine Running Self-Test?** **NOTE: On some vehicles it is necessary to depress and release the brake after the dynamic response code 1(0) but before the brief WOT.**	Yes ▶ No ▶	GO to FD2 . RERUN Engine Running Self-Test. PRESS brake once during test.
FD2 CHECK FOR BOO CIRCUIT CYCLING		
o Key off, wait 10 seconds. o Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o Install breakout box, leave processor disconnected. o DVOM on 20 volt scale. o Measure voltage between Test Pin 2 and Test Pin 40 at the breakout box while depressing and releasing brake. o **Does the voltage cycle?**	Yes ▶ No ▶	REMOVE breakout box. REPLACE processor. RERUN Quick Test. GO to FD3 .
FD3 CHECK BOO CIRCUIT FOR SHORT TO GROUND		
o Key off. o Breakout box installed, processor disconnected. o DVOM on 200,000 Ohm scale. o Disconnect 12A581 to 14401 harness connector shown on pinpoint test FD cover pages. o Measure resistance between Test Pin 2 and Test Pin 40 at the breakout box. o **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to Shop Manual, Group 32, Lighting System, to SERVICE stoplamp circuit. REMOVE breakout box. SERVICE short circuit. RERUN Engine Running Self-Test.

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Brake On/Off (BOO) — Pinpoint Test FD

TEST STEP	RESULT ▶	ACTION TO TAKE
FD5 SERVICE CODE 75: CHECK FOR BOO CIRCUIT CYCLING		
Service Code 75 indicates that while the brake pedal was released during the Engine Running Self-Test, the BOO signal was high. Possible causes are: — Brake pedal depressed during entire Engine Running Self-Test — Open BOO/stoplamp circuit (between processor and stoplamp ground) — Short to POWER — Faulty processor • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 20 volt scale. • Measure voltage between Test Pin 2 and Test Pin 40 at the breakout box while depressing and releasing the brake. • **Does the voltage cycle?**	Yes ▶ No ▶	REMOVE breakout box. REPLACE processor. RERUN Quick Test. GO to **FD6**.
FD6 CHECK BOO CIRCUIT FOR SHORT TO POWER		
• Key off. • Breakout box installed, processor disconnected. • DVOM on 20 volt scale. • Disconnect 12A581 to 14401 harness connector shown on pinpoint test FD cover pages. • Measure voltage between Test Pin 2 at the breakout box and engine block ground. • **Is voltage greater than 1.0 volts?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT processor. SERVICE short circuit. RERUN Engine Running Self-Test. GO to **FD7**.
FD7 CHECK CONTINUITY OF BOO CIRCUIT		
• Key off. • Breakout box installed, processor disconnected. • DVOM on 200 ohm scale. • 12A581 to 14401 harness connector disconnected. • Measure resistance between Test Pin 2 at the breakout box and BOO circuit at the 12A581 harness connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to Shop Manual, Group 32, Lighting System, to SERVICE stoplamp circuit. REMOVE breakout box. RECONNECT processor. SERVICE open circuit. RERUN Engine Running Self-Test.

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Brake On/Off (BOO) — Pinpoint Test — FD

TEST STEP	RESULT ▶	ACTION TO TAKE
FD10 SERVICE CODE 74: VERIFY BRAKE WAS PRESSED		
Service Code 74 indicates that when the brake pedal was depressed and released during the Engine Running Self-Test, the BOO signal did not cycle high and low. Possible causes are: — Brake pedal not depressed and released during the Engine Running Self-Test — Brake pedal depressed during entire Engine Running Self-Test — Open BOO/stoplamp circuit — Short to GROUND or POWER — Faulty processor • **Did you press brake during the Engine Running Self-Test?** **NOTE: On some vehicles it is necessary to depress and release the brake after the dynamic response code 1(0) but before the brief WOT.**	Yes ▶ No ▶	GO to FD11 . RERUN Engine Running Self-Test. PRESS brake once during test.
FD11 CHECK FOR BOO CIRCUIT CYCLING		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 20 volt scale. • Measure voltage between Test Pin 2 (Test Pin 5 for all 3.8L SEFI's, 3.0L SHO) and Test Pin 40 at the breakout box while depressing and releasing brake. • **Does the voltage cycle?**	Yes ▶ No ▶	REMOVE breakout box. REPLACE processor. RERUN Quick Test. GO to FD12 .

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Brake On/Off (BOO) | Pinpoint Test | FD

TEST STEP	RESULT ▶	ACTION TO TAKE
FD12 CHECK CONTINUITY OF BOO CIRCUIT		
• Key off. • Breakout box installed, processor disconnected. • DVOM on 200 ohm scale. • Disconnect connector shown on cover pages of pinpoint test FD (12A581 harness connector to 14401 or 14290 harness connector). • Measure resistance between Test Pin 2 (Test Pin 5 for all 3.8L SEFI's, 3.0L SHO) at the breakout box and BOO circuit at the 12A581 harness connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to FD13 . REMOVE breakout box. RECONNECT processor. SERVICE open circuit. RERUN Engine Running Self-Test.
FD13 CHECK BOO CIRCUIT FOR SHORT TO POWER		
• Key off. • Breakout box installed, processor disconnected. • 12A581 to 14401/14290 vehicle harness disconnected. • DVOM on 20 volt scale. • Measure voltage between Test Pin 2 (Test Pin 5 for all 3.8L SEFI's, 3.0L SHO) at the breakout box and engine block ground. • **Is voltage greater than 1.0 volts?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT processor. SERVICE short circuit. RERUN Engine Running Self-Test. GO to FD14 .
FD14 CHECK BOO CIRCUIT FOR SHORT TO GROUND		
• Key off. • Breakout box installed, processor disconnected. • 12A581 to 14401/14290 vehicle harness disconnected. • DVOM on 200,000 Ohm scale. • Measure resistance between Test Pin 2 (Test Pin 5 for all 3.8L SEFI's, 3.0L SHO) and Test Pin 40 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	BOO circuit OK. GO to Shop Manual, Group 32, Lighting System (Group 17 for compact truck), to SERVICE stoplamp circuit. REMOVE breakout box. SERVICE short circuit. RERUN Engine Running Self-Test.

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Power Steering Pressure Switch (PSPS)

Pinpoint Test

FF

Note

You should enter this Pinpoint Test only when a Service Code 52 is received in Quick Test Steps 3.0, 5.0 or 7.0.

Remember

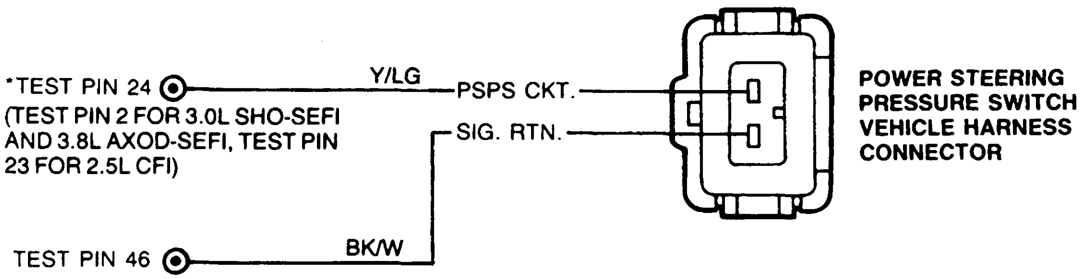
To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Idle speeds/throttle stop adjustment
- Binding throttle shaft/linkage or speed control linkage

This Pinpoint Test is intended to diagnose only the following:

- Power steering pressure switch (-3N824-)
- Switch harness circuits: PSPS SIGNAL, and SIGNAL RETURN
- Processor assembly (-12A650-)

Pinpoint Test Schematic



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9658-D

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Power Steering Pressure Switch (PSPS) — Pinpoint Test FF

TEST STEP	RESULT ▶	ACTION TO TAKE
FF1 ATTEMPT TO ELIMINATE CODE 52		
NOTE: Some vehicles are equipped with a Power Steering Pressure Switch software strategy, but do not have Power Steering hardware released for the engine/vehicle application. When Service Code 52 is received in Key On Engine Off, check to see if the vehicle is equipped with Power Steering. If not, disregard servicing the Code 52. Return to Quick Test Section to service other codes. Service Code 52 indicates that the Power Steering Pressure Switch (PSPS) circuit is open. Possible causes are: — Faulty PSPS switch — Open harness — Faulty processor • Key off, wait 10 seconds. • Disconnect PSPS. • Jumper PSPS circuit to SIGNAL RETURN at vehicle harness connector. • Rerun Key On Engine Off Self-Test. • **Is Code 52 still present?**	Yes ▶ No ▶	GO to FF2 . REPLACE PSPS. RERUN Quick Test.
FF2 PSPS HARNESS CHECK		
• Key off, wait 10 seconds. • PSPS disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 46 at the breakout box and SIGNAL RETURN at the PSPS vehicle harness connector. • Measure resistance between Test Pin 24 (Test Pin 23 for 2.5L CFI, Test Pin 2 for 3.0L SHO-SEFI and 3.8L AXOD-SEFI) at the breakout box and PSPS circuit at the PSPS vehicle harness connector. • **Are both readings less than 5 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT all components. REPLACE processor. RERUN Quick Test. REMOVE breakout box. RECONNECT all components. SERVICE open circuit. RERUN Quick Test.

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Power Steering Pressure Switch (PSPS) | Pinpoint Test | FF

TEST STEP	RESULT ▶	ACTION TO TAKE
FF3 SWITCH INTEGRITY		
o Install tachometer. o Start engine, allow to idle in NEUTRAL/PARK. o Disconnect PSPS at switch. o **Does rpm increase?**	Yes ▶ No ▶	REPLACE PSPS. GO to FF4 .
FF4 PSPS HARNESS CHECK		
o Key off, wait 10 seconds. o PSPS disconnected. o Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o Install breakout box, leave processor disconnected. o DVOM on 200,000 ohm scale. o Measure resistance between Test Pin 24 (Test Pin 23 for 2.5L CFI, Test Pin 2 for 3.0L SHO-SEFI and 3.8L AXOD-SEFI) and Test Pin 46 at the breakout box. o **Is resistance less than 10,000 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT all components. SERVICE short in harness. RERUN Quick Test. REMOVE breakout box. RECONNECT all components. REPLACE processor. RERUN Quick Test.
FF5 SERVICE CODE 52 ENGINE RUNNING SELF-TEST		
NOTE: Some vehicles are equipped with a Power Steering Pressure Switch software strategy, but do not have Power Steering hardware released for the engine/vehicle application. When Service Code 52 is received in Key On Engine Running, check to see if the vehicle is equipped with Power Steering. If not, disregard servicing the Code 52. Return to Quick Test Section to service other codes. Service Code 52 indicates that the Power Steering Pressure Switch (PSPS) did not change states due to the switch staying either open or closed. Possible causes are: — Faulty PSPS switch — Open or grounded harness — Faulty processor o **Did you turn the steering wheel at least one-half turn within 1 to 2 seconds after engine ID code?** **NOTE: Make sure the front wheels are centered (no load condition).**	Yes ▶ No ▶	GO to FF6 . RERUN Quick Test.

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Power Steering Pressure Switch (PSPS) — Pinpoint Test FF

TEST STEP		RESULT ▶	ACTION TO TAKE
FF6	DETERMINE WHETHER THE PROCESSOR CAN IDENTIFY AN OPEN CIRCUIT		
	• Key off, wait 10 seconds. • PSPS disconnected. • Run Key On Engine Off Self-Test. • **Is Code 52 present?**	Yes ▶ No ▶	GO to FF8 . GO to FF7 .
FF7	PSPS HARNESS CHECK		
	• Key off, wait 10 seconds. • PSPS disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion or loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 46 and Test Pin 24 (Test Pin 23 for 2.5L CFI, Test Pin 2 for 3.0L SHO-SEFI and 3.8L AXOD-SEFI) at the breakout box. • **Is resistance 10,000 ohms or less?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT all components. SERVICE short circuit. RERUN Quick Test. REMOVE breakout box. RECONNECT all components. REPLACE processor. RERUN Quick Test.
FF8	PSPS POSITION KEY ON ENGINE OFF VS. RUNNING		
	• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • Connect PSPS. • DVOM on 200 ohm scale. • Key on. • Measure resistance between Test Pin 24 (Test Pin 23 for 2.5L CFI, Test Pin 2 for 3.0L SHO-SEFI and 3.8L AXOD-SEFI) and Test Pin 46 at the breakout box. • Start engine. • **Does resistance remain less than 10 ohms between Key On, Engine Off and Engine Running?**	Yes ▶ No ▶	GO to FF9 . GO to FF11 .

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Power Steering Pressure Switch (PSPS) | Pinpoint Test | FF

TEST STEP		RESULT ▶	ACTION TO TAKE
FF9	PSPS POSITION ENGINE RUNNING NO LOAD VS. LOAD		
	• Engine idling. • Breakout box installed, processor connected. • PSPS connected. • Clutch is not depressed on 3.0L SHO-SEFI manual vehicles. • DVOM on 200 ohm scale. • Measure the resistance between Test Pin 24 (Test Pin 23 for 2.5L CFI, Test Pin 2 for 3.0L SHO-SEFI and 3.8L AXOD-SEFI) and Test Pin 46 at the breakout box. • Turn the steering wheel at least one-half turn then return. • **Does resistance change from less than 10 ohms to infinity (indicating PSPS opening), then returning to 10 ohms or less when steering wheel is returned to center position?**	Yes ▶ No ▶	PSPS system OK, REMOVE breakout box and RETURN to Quick Test Step 5.0 to continue Diagnostics. GO to FF10 .
FF10	PSPS ALWAYS CLOSED VS. POWER STEERING HYDRAULIC PRESSURE WITH ENGINE RUNNING		
	• At this point in the Diagnostics there are only two possible causes for the original Code 52 Engine Running: — PSPS (switch) that will not open. — Low available hydraulic pressure. • Key off, wait 10 seconds. • Substitute original PSPS with a known good PSPS. • Run Engine Running Self-Test. (Turn steering wheel at least one-half turn after engine ID code.) • **Is Code 52 still present?**	Yes ▶ No ▶	GO to Power Steering Pressure Diagnostics, Shop Manual, Group 13, looking for low pressure. Original Code 52 Engine Running was a result of a bad PSPS (switch). REMOVE all equipment and CONTINUE, if necessary, with any other Diagnostics.

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Power Steering Pressure Switch (PSPS)

Pinpoint Test FF

TEST STEP		RESULT ▶	ACTION TO TAKE
FF11	PSPS ALWAYS OPEN VS. POWER STEERING HYDRAULIC PRESSURE WITH ENGINE RUNNING		
	• At this point in the Diagnostics there are two possible causes for the original Code 52 Engine Running: — PSPS (switch) that always remains open during Engine Running. — Excessively high hydraulic pressure. • Key off, wait 10 seconds. • Substitute original PSPS with a known good PSPS. • Run Engine Running Self Test. (Turn steering wheel at least one-half turn after engine ID code.) • **Is Code 52 still present?**	Yes ▶	GO to Power Steering Pressure Diagnostics in Shop Manual, Group 13, looking for high pressure.
		No ▶	Original Code 52 Engine Running was a result of a bad PSPS (switch). REMOVE all equipment and CONTINUE, if necessary, with any other Diagnostics.

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Fuel Control | Pinpoint Test | H

Note

You should enter this Pinpoint Test only when a Service Code 41, 42, 65, 85, 86, 91, 92 or 93 is received in Quick Test Step 5.0, 6.0 or when directed here from Quick Test Step 7.0 or Pinpoint Test S.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Ignition Coil
- Distributor Cap
- Distributor Rotor
- Fouled Spark Plugs
- Spark Plug Wires
- CANP Problems
- PCV Valves (see note below)
- Distributorless Ignition System
- EGR Valve and Gasket
- Air Filter
- Fuel Contamination, Engine Oil
- Poor Power Ground
- Fuel Pressure
- Manifold Leaks, Intake/Exhaust
- Engine Not at Normal Operating Temperatures

This Pinpoint Test is intended to diagnose only the following:

- HEGO Sensor
- HEGO Signal and Ground Circuit
- HEGO Sensor Connection
- Vacuum Systems
- Fuel Injector
- Processor Assembly
- Harness Circuits HEGO GRD, HEGO, INJ. 1 – 8, and VPWR

NOTE: Fuel contaminated engine oil may affect 41, 42, 91 and 92 Service Codes, so if it is suspected, remove the PCV from the valve cover, and rerun Quick Test. If the problem is corrected, then change the engine oil and filter.

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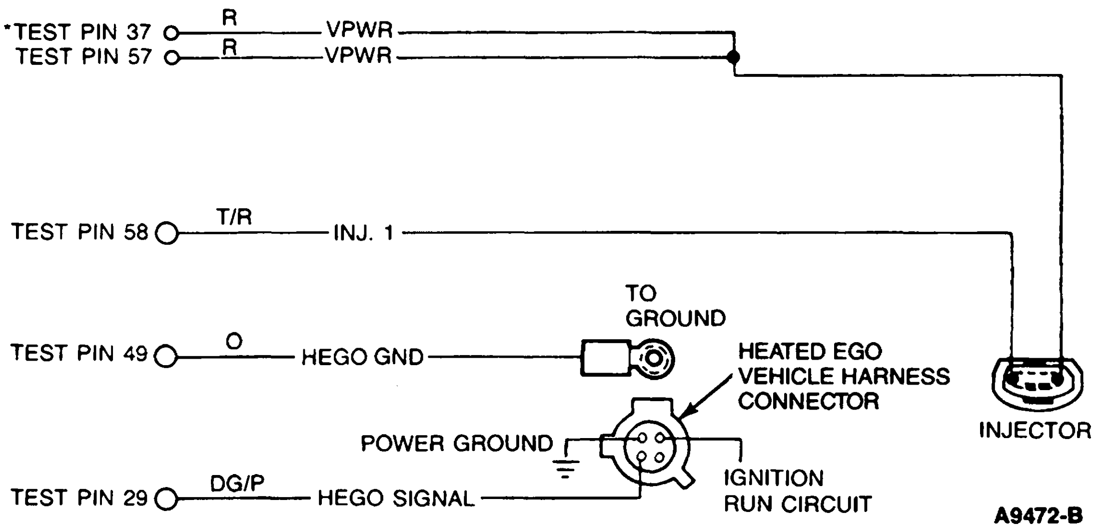
Fuel Control

Pinpoint Test **H**

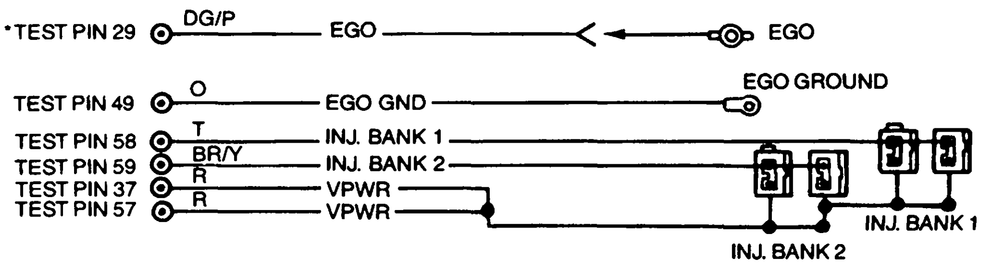
Pinpoint Test Schematic

All CFI



A9472-B

2.3L EFI-TC



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A12812-A

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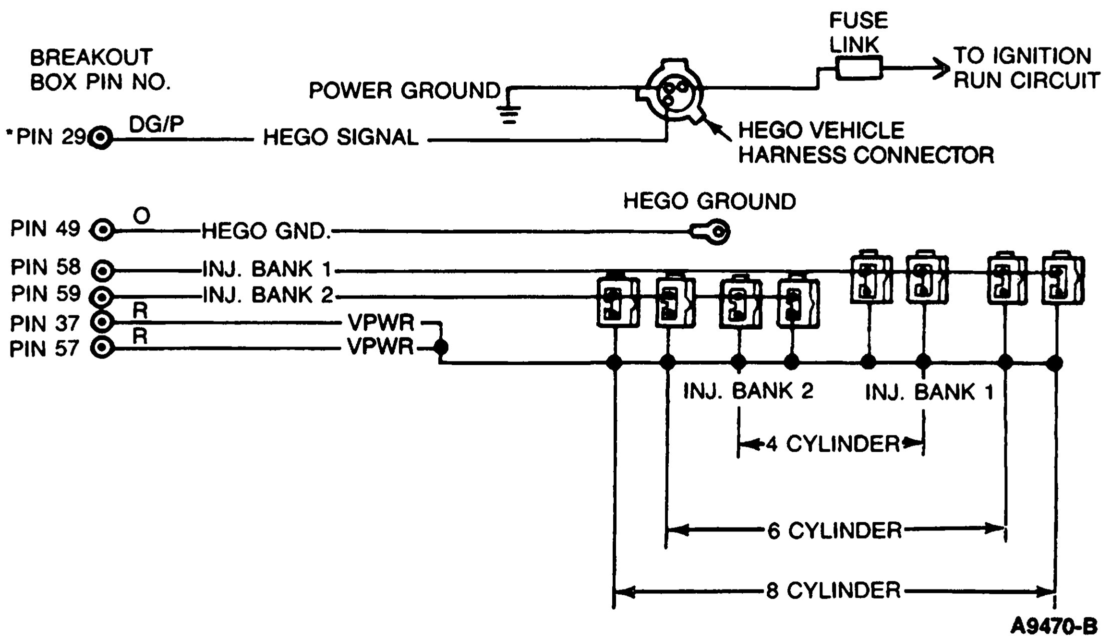
Fuel Control

Pinpoint Test **H**

Pinpoint Test Schematic

All EFI (Except 2.3L EFI-TC)



Test Pin 58 **INJ BANK 1**

Application	Wire Color
2.3L DIS Truck 2.9L Truck	LG/W
1.9L EFI	T/R
All Others	T/O

Test Pin 59 **INJ BANK 2**

Application	Wire Color
1.9L EFI	T/O
All Others	T/R

* **TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

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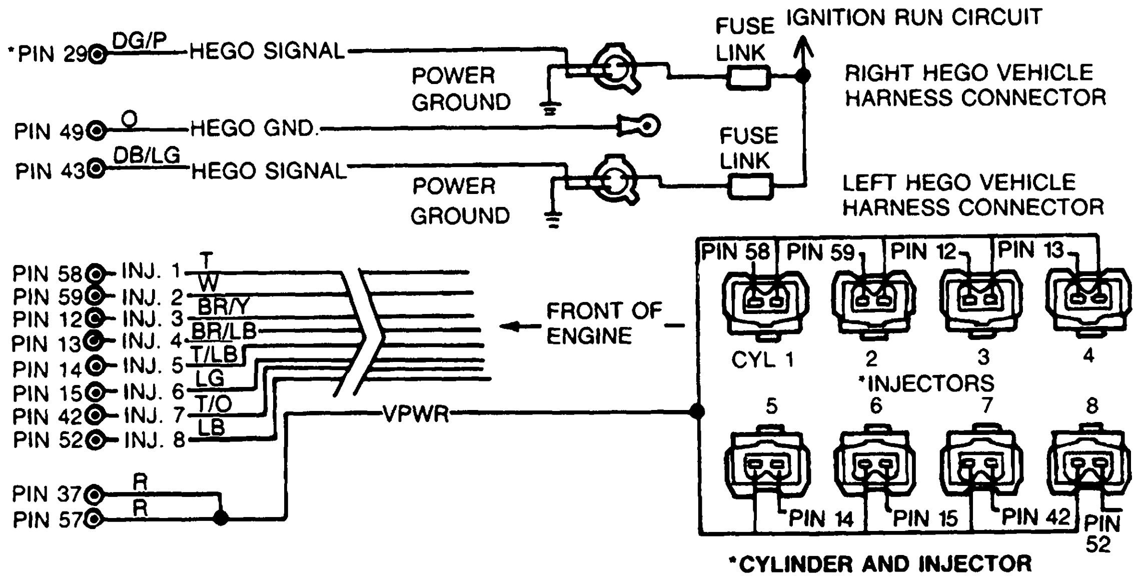
Fuel Control	Pinpoint Test	H

5.0L SEFI and 5.0L SEFI Mass Air



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

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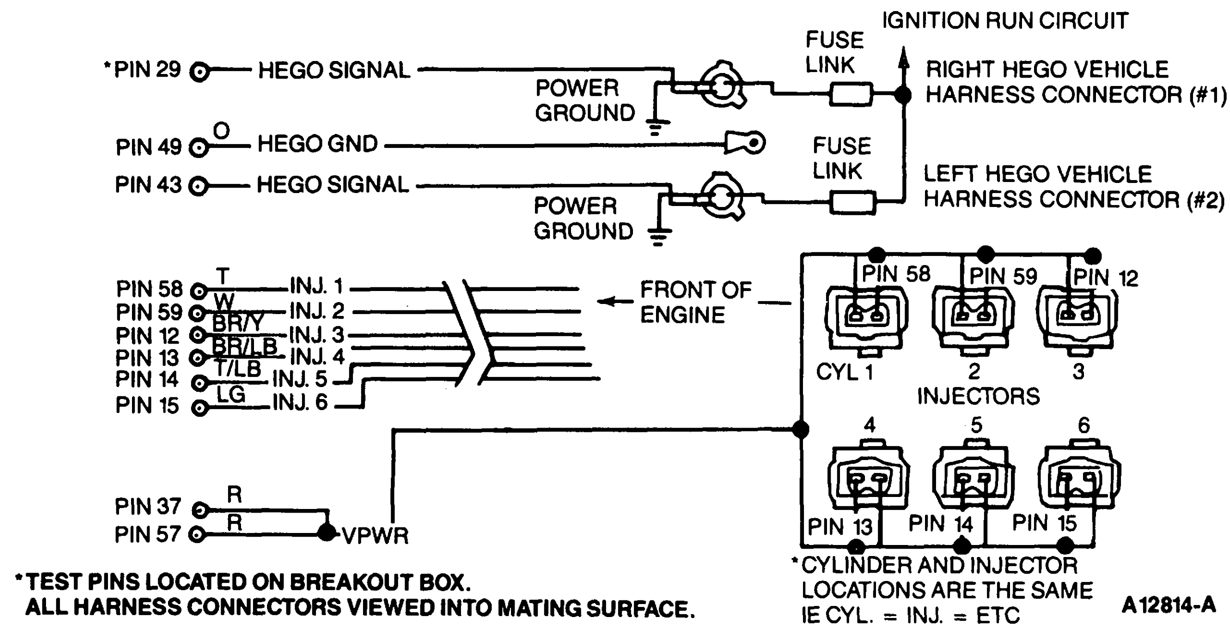
Fuel Control

Pinpoint Test **H**

3.8L SEFI, 3.8L SC SEFI and 3.0L SHO SEFI



Test Pin 29 — Right HEGO (#1)

Application	Wire Color
3.0L SHO SEFI	DG/P
3.8L AXOD SEFI	DB/LG
All Others	T/O

Test Pin 43 — Left HEGO (#2)

Application	Wire Color
3.0L SHO SEFI	DB/LG
3.8L AXOD SEFI	DG/P
All Others	T/R

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Fuel Control

Pinpoint Test H

FUEL PRESSURE SPECIFICATION TABLE

1988 PASSENGER CAR ENGINES

VALUES ARE IN PSI AND kPa

	1.9L EFI	1.9L CFI	2.3L OHC EFI	2.3L TC EFI	2.3L HSC EFI	2.5L CFI	3.0L EFI	3.0L SHO SEFI	3.8L AXOD SEFI	3.8L RWD SEFI	3.8L SC SEFI	5.0L SEFI	5.0L MA SEFI
ENGINE RUNNING	30 – 45 PSI 210 – 310 kPa	13 – 17 PSI 90 – 120 kPa	30 – 45 PSI 210 – 310 kPa	30 – 55 PSI 210 – 345 kPa	45 – 60 PSI 310 – 415 kPa	13 – 17 PSI 90 – 120 kPa	30 – 45 PSI 210 – 310 kPa	28 – 33 PSI 193 – 227 kPa	30 – 45 PSI 210 – 310 kPa	30 – 45 PSI 210 – 310 kPa	30 – 40 PSI 210 – 280 kPa	30 – 45 PSI 210 – 310 kPa	30 – 45 PSI 210 – 310 kPa
KEY ON ENGINE OFF	35 – 45 PSI 240 – 310 kPa	13 – 17 PSI 90 – 120 kPa	35 – 45 PSI 240 – 310 kPa	35 – 45 PSI 240 – 310 kPa	50 – 60 PSI 345 – 415 kPa	13 – 16 PSI 90 – 120 kPa	35 – 45 PSI 240 – 310 kPa	30 – 45 PSI 210 – 310 kPa	35 – 45 PSI 240 – 310 kPa	35 – 45 PSI 240 – 310 kPa	35 – 40 PSI 240 – 280 kPa	35 – 45 PSI 240 – 310 kPa	35 – 45 PSI 240 – 310 kPa

1988 LIGHT TRUCK ENGINES

VALUES ARE IN PSI AND kPa

	2.3L EFI	2.9L EFI	3.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.5L EFI
ENGINE RUNNING	30 – 45 PSI 210 – 310 kPa	30 – 45 PSI 210 – 310 kPa	30 – 45 PSI 210 – 310 kPa	45 – 60 PSI 310 – 415 kPa	30 – 45 PSI 210 – 310 kPa	30 – 45 PSI 210 – 310 kPa	30 – 45 PSI 210 – 310 kPa
KEY ON ENGINE OFF	35 – 45 PSI 240 – 310 kPa	35 – 45 PSI 240 – 310 kPa	35 – 45 PSI 240 – 310 kPa	50 – 60 PSI 345 – 415 kPa	35 – 45 PSI 240 – 310 kPa	35 – 45 PSI 240 – 310 kPa	35 – 45 PSI 240 – 310 kPa

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Fuel Control — Pinpoint Test H

TEST STEP	RESULT ▶	ACTION TO TAKE
H1 CHECK FUEL PRESSURE		
HEGO Engine Running codes 41 and 91 indicate the system is always lean. HEGO Engine Running codes 42 and 92 indicate the system is always rich. **NOTE: For vehicles with dual HEGOs, codes 41 and 42 refer to right HEGO sensor; codes 91 and 92 refer to left HEGO sensor.** • Key off, wait 10 seconds. • Install fuel pressure gauge. • Verify that manifold vacuum is connected to the fuel pressure regulator if applicable. • Start and run engine at idle. • Refer to Fuel Pressure Specification Table. • Is fuel pressure within specification for the engine being tested? **FOR NO STARTS:** • If engine will not run, cycle the key off to on several times. • Refer to Fuel Pressure Specification Table. • **Is fuel pressure within specification for the engine being tested?**	Yes ▶ No ▶	GO to H2. GO to Section 11 for Electric Fuel pump and fuel pressure regulator checks.
H2 CHECK SYSTEM'S ABILITY TO HOLD FUEL PRESSURE		
• Key on, engine off. • **Does fuel pressure remain at specification for 60 seconds?**	Yes ▶ No ▶	GO to H3. For SEFI GO to H9. All others GO to H6.

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Fuel Control

Pinpoint Test **H**

TEST STEP	RESULT ▶	ACTION TO TAKE
H3 FUEL DELIVERY TEST		
NOTE: Verify fuel quality; air and/or water will also pressurize and look like acceptable fuel delivery. • Key off. • Fuel pressure gauge installed. • Pressurize fuel system per step H1. • Locate and disconnect the inertia switch. • Crank engine for 5 seconds. • **Does pressure drop greater than 5 psi. (34 kPa.) by the end of the 5 second crank cycle?**	Yes ▶	The EEC-IV system is not the cause of the No Start. REMOVE the fuel pressure gauge. RECONNECT the inertia switch. REFER to Section 2 for other No Start routines. If the complaint was runs rough, misses or a fuel service code GO to H4. For SEFI GO to H9.
	No ▶	REMOVE fuel pressure gauge. RECONNECT inertia switch. GO to H4.

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Fuel Control

Pinpoint Test H

INJECTOR BANK RESISTANCE SPECIFICATION TABLE #1

PASSENGER CAR ENGINES				
VALUES ARE IN OHMS				
1.9L EFI	2.3L OHC EFI	2.3L TC EFI	2.3L HSC EFI	3.0L EFI
1.2 TO 1.8	7.0 TO 9.5	1.2 TO 1.8	7.0 TO 9.5	5.0 TO 6.5

LIGHT TRUCK ENGINES						
VALUES ARE IN OHMS						
2.3L EFI	2.9L EFI	3.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.5L EFI
7.0 TO 9.5	5.0 TO 6.5	5.0 TO 6.5	5.0 TO 6.5	3.5 TO 5.0	2.5 TO 5.0	2.5 TO 5.0

SINGLE INJECTOR RESISTANCE SPECIFICATION TABLE #2

PASSENGER CAR ENGINES												
VALUES ARE IN OHMS												
1.9L EFI	1.9L CFI	2.3L OHC EFI	2.3L TC EFI	2.3L HSC EFI	2.5L CFI	3.0L EFI	3.0L SHO SEFI	3.8L AXOD SEFI	3.8L RWD SEFI	3.8L SC SEFI	5.0L SEFI	5.0L MA SEFI
2.0 TO 2.7	1.0 TO 2.0	15.0 TO 19.0	2.0 TO 3.0	13.5 TO 16.0	1.0 TO 2.0	15.0 TO 18.0	13.5 TO 16.0	13.5 TO 16.0	13.5 TO 16.0	13.5 TO 16.0	13.5 TO 19.0	13.5 TO 19.0

LIGHT TRUCK ENGINES						
VALUES ARE IN OHMS						
2.3L EFI	2.9L EFI	3.0L EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.5L EFI
13.5 TO 18.0	13.5 TO 18.0	15.0 TO 18.0	13.5 TO 18.0	13.5 TO 18.0	13.5 TO 18.0	13.5 TO 19.0

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Fuel Control

Pinpoint Test H

TEST STEP	RESULT ▶	ACTION TO TAKE
H4 CHECK RESISTANCE OF INJECTOR(S) AND HARNESS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. **For EFI:** — Measure resistance of INJECTOR BANK 1 between Test Pin 37 and Test Pin 58 at the breakout box. Record resistance. — Measure resistance of INJECTOR BANK 2 between Test Pin 37 and Test Pin 59 at the breakout box. Record resistance. — Refer to Injector Resistance Specification Table #1. **For SEFI:** — From cylinder balance test: Measure resistance between the suspect INJECTOR circuit Test Pin and Test Pin 37 at the breakout box. Record resistance. — For No Starts: Pick any injector and measure resistance between that INJECTOR circuit's Test Pin and Test Pin 37 at the breakout box. Record resistance. — Refer to Injector Resistance Specification Table #2. **For CFI:** — Measure resistance of INJECTOR circuit between Test Pin 37 and Test Pin 58 at the breakout box. Record resistance. — Refer to Injector Resistance Specification Table #1. • **Is/are resistance(s) within specification for the appropriate engine?**	Yes ▶ No ▶	GO to H6 . **For EFI** GO to H5 . **For SEFI:** REMOVE breakout box. RECONNECT processor. SERVICE open or short in VPWR or injector circuit of the suspect injector(s). If OK, REPLACE injector RERUN Quick Test and Cylinder Balance Test. For NO START: SERVICE open in VPWR circuit. **For CFI:** REMOVE breakout box. RECONNECT processor. SERVICE open or short in harness/connector If OK, REPLACE injector RERUN Quick Test.

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Fuel Control

Pinpoint Test | **H**

<table>
<tr><th>TEST STEP</th><th>RESULT ▶</th><th>ACTION TO TAKE</th></tr>
<tr><td>H5 ISOLATE FAULTY INJECTOR CIRCUIT

• Key off.
• Breakout box installed, processor disconnected.
• Disconnect all injectors on suspect bank.
• DVOM on 200 ohm scale.
• Connect one injector and measure resistance between Test Pin 37 and either Test Pin 58 or 59 as appropriate.
• Disconnect that injector and repeat process for each of the remaining injectors.
• Refer to Injector Resistance Specification Table #2.
• Is/are resistance(s) within specification for the appropriate engine?</td><td>Yes ▶

No ▶</td><td>GO to H6 .

REMOVE breakout box. RECONNECT processor and injectors. SERVICE open or short in VPWR or injector circuit of the suspect injector(s). If OK, REPLACE injector. RERUN Quick Test.</td></tr>
<tr><td>H6 CHECK INJECTOR DRIVER SIGNAL

Requires standard non-powered 12 volt test lamp.
• Key off.
• Breakout box installed.
• Connect processor to breakout box.
For EFI:
— Connect test lamp between Test Pin 37 and Test Pin 58 at the breakout box.
— Connect test lamp between Test Pin 37 and 59 at the breakout box.
For SEFI:
— Connect test lamp between Test Pin 37 and the suspect injectors Test Pin at the breakout box.
For CFI:
— Connect test lamp between Test Pin 37 and Test Pin 58 at the breakout box.
• Crank or start engine.
• Is glow on lamp dim?
NOTE: Properly operating systems will show a dim glow on the lamp.</td><td>Yes ▶

No ▶</td><td>For ALL SEFI VEHICLES: REMOVE breakout box. RECONNECT processor GO to Section 4 for injector testing and cleaning instructions. After any servicing, RERUN Quick Test and Cylinder Balance Test.

For ALL OTHER ENGINES: GO To H7 .

NO LIGHT:

VERIFY 12 volt at Test Pins 37 and 57.

BRIGHT LIGHT:

CHECK injector circuit for shorts to ground.

If OK, REMOVE breakout box. REPLACE processor RERUN Quick Test.</td></tr>
</table>

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Fuel Control

Pinpoint Test H

TEST STEP	RESULT ▶	ACTION TO TAKE
H7 CHECK EXTERNAL SOURCE FOR FUEL PRESSURE PROBLEM		
• Key off. • Pressurize fuel system per Test Step H1. **For EFI:** — Visually look for fuel leaking at fuel injector O-rings, fuel pressure regulator, and fuel rails. **For CFI:** — Remove air inlet tube at the fuel charging assembly. — Visually look for fuel leaking at the air horn inlet, fuel injector O-ring, fuel pressure regulator and fuel line to fuel charging assembly. • **Is there a visible leak?**	Yes ▶	REMOVE pressure gauge. SERVICE as necessary. REFER to Shop Manual Group 24 (Group 10 for Compact Truck) for service procedure. After servicing leak, RERUN Quick Test.
	No ▶	**For EFI:** GO to H8. **For CFI:** REMOVE pressure gauge. Fuel delivery system is OK. Problem is in an area common to all cylinders, i.e. fuel injector, air/vacuum leak, fuel contamination, EGR, etc.
H8 INJECTOR BALANCE TEST		
• Connect tachometer to engine. Run engine at idle. • Disconnect and reconnect the injectors one at a time: Note rpm drop for each injector. • **Does each injector produce at least a 100 rpm momentary drop?** **NOTE: ISC will attempt to re-establish rpm.**	Yes ▶	Fuel delivery OK. Problem is in an area common to all cylinders i.e. air/vacuum leak, fuel contamination, EGR etc.
	No ▶	GO to Section 4 for injector testing and cleaning instructions. After any servicing, RERUN Quick Test.

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Fuel Control

Pinpoint Test H

TEST STEP	RESULT ▶	ACTION TO TAKE
H9 CYLINDER BALANCE TEST: SEFI ENGINES ONLY		
The Cylinder Balance Test switches each injector OFF and ON one at a time. Service codes correspond to the cylinder number, e.g. Service Code 30 indicates a problem with cylinder No. 3. A Service Code 90 indicates a pass. The Cylinder Balance Test is designed to aid in the detection of a non-contributing cylinder. The Pinpoint Test Steps are designed to isolate only EEC-IV related problems. Refer to Quick Test Appendix for detailed information about Cylinder Balance Test. o Run the Engine Running Self-Test. o After the last repeated code, wait 5-10 seconds. o "Goose" throttle lightly (not wide-open-throttle). o Cylinder Balance Test will be performed. Time of test is approximately 2-3 minutes. o **Is Code 90 present?**	Yes ▶ No ▶	**FOR ALL SEFI MA** vehicles with Service Code 41/91 GO to H11, with Service Code 42/92 GO to H23. **FOR ALL OTHERS,** fuel delivery is O.K. Problem is in an area common to all cylinders, i.e., air/ vacuum leak, fuel contamination, EGR, etc. GO to H4.

CYLINDER BALANCE TABLE
SERVICE CODE VS. CYLINDER

SERVICE CODE	90	10	20	30	40	50	60	70	80	77*
CYLINDER/INJECTOR NUMBER	PASS	1	2	3	4	5	6	7	8	RERUN TEST
BREAKOUT BOX PIN NUMBER		58	59	12	13	14	15	42	52	

* If throttle is touched (moved) during Cylinder Balance Test, Service Code 77 will appear, indicating test was not completed.

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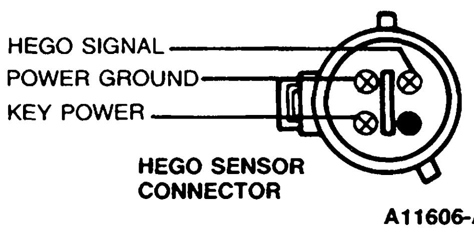
Fuel Control — Pinpoint Test H

TEST STEP	RESULT ▶	ACTION TO TAKE
H11 SERVICE CODE 41/91: FUEL CONTROL ALWAYS LEAN		
NOTE: For vehicles with dual HEGOs, code 41 refers to the right or #1 HEGO sensor. Code 91 refers to the left or #2 HEGO sensor. HEGO Engine Running codes 41 and 91 indicate the system is always lean. • Run engine at 2000 rpm for 2 minutes. • Key off, wait 10 seconds. • Rerun Engine Running Self-Test. • **Is Code 41/91 present?**	Yes ▶ No ▶	**For engines with:** — MAP sensors GO to H12. — Vane Air Meters GO to H13. — Mass Air Meters GO to H14. GO to H20.
H12 CHECK HEGO SENSOR ON ENGINES WITH MAP SENSORS		
NOTE: Vacuum/air leaks in non-EEC-IV areas could also cause Code 41/91. Check for: **— Leaking vacuum actuator (e.g. A/C control motor)** **— Engine sealing** **— EGR system** **— PCV system** **— Lead contaminated HEGO sensor** • Key off. • Disconnect appropriate HEGO sensor from vehicle harness. • Connect DVOM to HEGO SIGNAL at the sensor and battery negative post. • Disconnect and plug vacuum line at MAP sensor. • DVOM on 20 volt scale. • Apply 10-14 in. Hg. (33-46 kPa) to MAP sensor. • Start engine and run at approximately 2,000 rpm for 2 minutes. • **Does the DVOM indicate greater than 0.5 volts within 2 minutes?**	Yes ▶ No ▶	GO to H15. RECONNECT MAP sensor vacuum line. REPLACE HEGO sensor. RERUN Quick Test.



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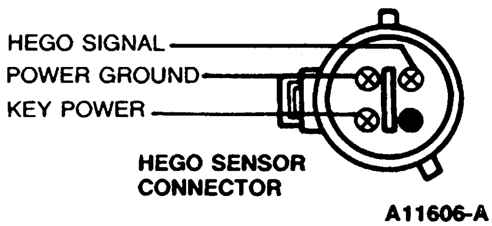
Fuel Control

Pinpoint Test H

TEST STEP		RESULT ▶	ACTION TO TAKE
H13	CHECK HEGO SENSOR ON ENGINES WITH VANE AIR METER		
	NOTE: Vacuum/air leaks in non-EEC-IV areas could also cause Code 41. Check for: **— Leaking vacuum actuator (e.g. A/C control motor)** **— Engine sealing** **— EGR system** **— PCV system** **— Lead contaminated HEGO sensor** **— Unmetered air leak between Air Meter and throttle body** Check EGO sensor on the 2.3L EFI TC using these same procedures. ∘ Key off. ∘ Disconnect HEGO sensor from vehicle harness ∘ Remove air cleaner to gain access to air meter inlet. Using a standard wood lead pencil, prop the air meter door partway open. ∘ Connect DVOM to HEGO SIGNAL at the sensor and battery negative post. ∘ DVOM on 20 volt scale. ∘ Start the engine and run at approximately 2000 rpm for 2 minutes. ∘ **Does the DVOM indicate greater than 0.5 volts within 2 minutes?**	Yes ▶	GO to $\boxed{H15}$.
		No ▶	REMOVE pencil from Air Meter. REINSTALL air cleaner. REPLACE HEGO sensor. RERUN Quick Test.



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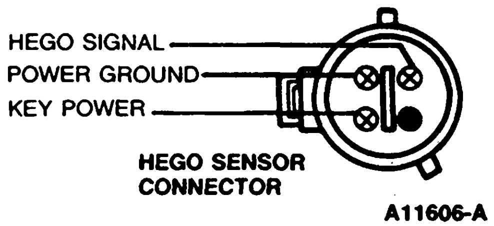
Fuel Control — Pinpoint Test H

TEST STEP	RESULT ▶	ACTION TO TAKE
H14 CHECK HEGO SENSOR ON ENGINES WITH MASS AIR SENSOR		
NOTE: The purpose of this test is to verify the HEGO sensor can generate greater than 0.5 volts during Engine Running Self-Test. Any Vacuum/air leaks in non-EEC-IV areas could also cause Code 41/91. Check for: — Leaking vacuum actuator (e.g. A/C control motor) — Engine sealing — EGR system — PCV system — Unmetered air leak between Mass Air Flow sensor and throttle body — Lead contaminated HEGO sensor • Key off. • Disconnect appropriate HEGO sensor from vehicle harness. • Connect DVOM to HEGO SIGNAL at the sensor and battery negative post. • DVOM on 20 volt scale. • Rerun Engine Running Self-Test and monitor HEGO sensor voltage. • **Is the voltage greater than 0.5 volts at the end of Self-Test?**	Yes ▶ No ▶	GO to H15. REPLACE HEGO sensor. RERUN Quick Test.



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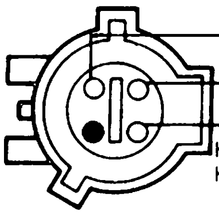
Fuel Control | Pinpoint Test | H

TEST STEP	RESULT ▶	ACTION TO TAKE
H15 CHECK CONTINUITY OF HEGO SIGNAL AND HEGO GROUND CIRCUITS		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • HEGO disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 49 at the breakout box and battery negative post. • Measure resistance between Test Pin 29 at the breakout box and HEGO SIGNAL at the vehicle harness connector. • For vehicles with dual HEGO, also measure resistance between Test Pin 43 at the breakout box and HEGO SIGNAL at the vehicle harness connector. • **Are all resistances less than 5.0 ohms?**  	Yes ▶ No ▶	GO to [H16]. REMOVE breakout box. RECONNECT processor, HEGO sensor, and any other components that are disconnected or removed. SERVICE open circuit. RERUN Quick Test.
H16 CHECK H/EGO CIRCUIT FOR SHORT TO GROUND		
• Key off. • Breakout box installed, processor disconnected. • HEGO disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 29 and Test Pin 40 at the breakout box. • For vehicles with dual HEGO also measure resistance between Test Pin 43 and Test Pin 40 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	2.3L EFI TC, GO to [H19]. All others GO to [H17]. REMOVE breakout box. RECONNECT processor and HEGO sensor. SERVICE short circuit. RERUN Quick Test.

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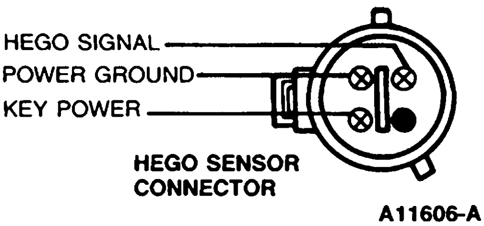
Fuel Control

Pinpoint Test H

TEST STEP		RESULT ▶	ACTION TO TAKE
H17	CHECK HEGO SENSOR FOR SHORT TO GROUND		
	• Key off. • Breakout box installed, processor disconnected. • HEGO disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between PWR GND and HEGO SIGNAL at the HEGO sensor connector. • **Is resistance greater than 10,000 ohms?**  	Yes ▶	**For engines with:** — MAP sensor GO to H18. — Vane Air Meter GO to H19. — Mass Air Meter REMOVE breakout box. RECONNECT HEGO sensor. REPLACE processor. RERUN Quick Test.
		No ▶	REMOVE breakout box. RECONNECT processor. REPLACE HEGO sensor. RERUN Quick Test.
H18	ATTEMPT TO ELIMINATE CODE 41 ON ENGINES WITH MAP SENSOR		
	• Key off. • Breakout box installed. • MAP vacuum line disconnected and plugged. • Connect processor to breakout box. • Reconnect HEGO sensor. • Apply 10-14 in. Hg. (3-46 kPa) vacuum to MAP sensor. • Start engine and run at approximately 2000 rpm for 2 minutes. Allow engine to return to idle. • Rerun Engine Running Self-Test. • **Is Code 41 still present?** **NOTE: Disregard other codes received at this time.**	Yes ▶	REMOVE breakout box. RECONNECT MAP sensor vacuum line. REPLACE processor. RERUN Quick Test.
		No ▶	REMOVE breakout box. RECONNECT processor and MAP sensor vacuum line. HEGO sensor input OK. GO to H1.

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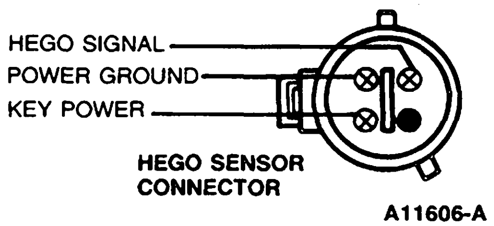
Pinpoint Test H

TEST STEP	RESULT ▶	ACTION TO TAKE
H19 ATTEMPT TO ELIMINATE CODE 41 ON ENGINES WITH VANE AIR METER		
o Key off. o Breakout box installed. o Connect processor to breakout box. o Reconnect H/EGO sensor. o Air cleaner removed, pencil inserted in vane meter inlet. o Start engine and run at approximately 2000 rpm for 2 minutes. o Rerun Engine Running Self-Test. o **Is Code 41 present?**	Yes ▶ No ▶	REMOVE breakout box. REMOVE pencil from vane meter. REINSTALL air cleaner. REPLACE processor. RERUN Quick Test. REMOVE breakout box. RECONNECT processor. H/EGO input circuit OK. GO to H1.
H20 CHECK RESISTANCE OF HEATER ELEMENT ON HEGO		
o Key off. o Disconnect HEGO. o DVOM on 200 ohm scale. o Measure resistance between KEY POWER circuit and PWR GND circuit at HEGO sensor connector. o Hot to warm resistance specification is 5.0 to 20.0 ohms. o **Is resistance within specification?** **NOTE: Room temperature resistance specification is 2.0 to 5.0 ohms.**	Yes ▶ No ▶	GO to H21. REPLACE HEGO sensor. RERUN Quick Test.



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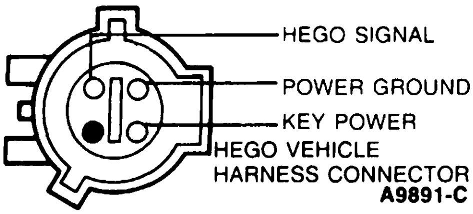
Fuel Control | Pinpoint Test | H

TEST STEP	RESULT ▶	ACTION TO TAKE
H21 CHECK FOR POWER AT HEGO HARNESS CONNECTOR		
• Key on, engine off. • HEGO disconnected. • DVOM on 20 volt scale. • Measure voltage between KEY POWER circuit and PWR GND circuit at the HEGO vehicle harness connector. • **Is voltage greater than 10.5 volts?**  	Yes ▶ No ▶	RECONNECT HEGO sensor. HEGO sensor system OK. GO to H1 . GO to H22 .
H22 CHECK CONTINUITY OF POWER GROUND CIRCUIT		
• Key off, wait 10 seconds. • HEGO disconnected. • DVOM on 200 ohm scale. • Measure resistance between PWR GND circuit at the HEGO vehicle harness connector and battery negative post. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	RECONNECT HEGO sensor. SERVICE open in KEY POWER circuit. RERUN Quick Test. RECONNECT HEGO sensor. SERVICE open in PWR GND circuit. RERUN Quick Test.

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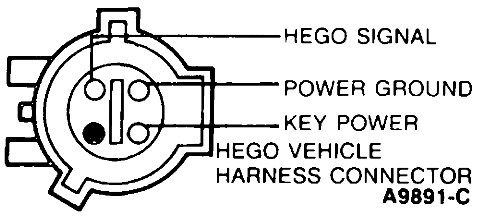
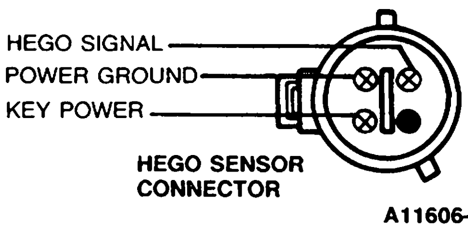
Pinpoint Test H

TEST STEP		RESULT ▶	ACTION TO TAKE
H23	SERVICE CODE 42/92: FUEL CONTROL ALWAYS RICH; CHECK HEGO SIGNAL FOR SHORT TO POWER		
	NOTE: For vehicles with dual HEGOs, code 42 refers to the right or #1 HEGO sensor. Code 92 refers to the left or #2 HEGO sensor. HEGO Engine Running codes 42 and 92 indicate the system is always rich. o Key off, wait 10 seconds. o Disconnect the appropriate HEGO sensor for Code 42/92. o DVOM on 20 volt scale. o Key on, engine off. o Measure voltage between HEGO SIGNAL and PWR GND at the HEGO vehicle harness connector. o **Is voltage less than 0.5 volts?**  	Yes ▶ No ▶	GO to H24. RECONNECT HEGO sensor. SERVICE HEGO circuit short to power. RERUN Quick Test.
H24	CHECK HEGO SENSOR FOR SHORT TO IGNITION RUN CIRCUIT		
	o Key off. o HEGO disconnected. o DVOM on 200,000 ohm scale. o Measure resistance between KEY POWER circuit and HEGO SIGNAL circuit at the HEGO sensor connector. o **Is resistance greater than 10,000 ohms?**  	Yes ▶ No ▶	GO to H25. REPLACE HEGO sensor. RERUN Quick Test.

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Pinpoint Test H

TEST STEP	RESULT ▶	ACTION TO TAKE
H25 ATTEMPT TO GENERATE CODE 41/91		
NOTE: Check EGO sensor on the 2.3L EFI TC using these same procedures. Non-EEC areas could cause a Service Code 42/92. Check for: — Fuel contaminated engine oil — Ignition caused misfire (fouled spark plug) — CANP problems • Key off, wait 10 seconds. • HEGO disconnected. • Jumper HEGO SIGNAL circuit at the HEGO vehicle harness connector to battery negative post. • Rerun Engine Running Self-Test. • **Is Code 41/91 present?**	Yes ▶	REMOVE jumper. For engines with MAP sensor GO to H26 . All others GO to H28 .
	No ▶	REMOVE jumper. RECONNECT HEGO sensor. DISCONNECT processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. SERVICE as necessary. If OK REPLACE processor. RERUN Quick Test.
H26 CHECK MAP SENSOR FOR VACUUM LEAK		
NOTE: Due to the MAP sensor's large influence on fuel control, there is a possibility that a Code 42/92 could be a result of a MAP problem, even though a Code 22 is not present. Therefore the next two Test Steps will verify proper vacuum to the MAP sensor and its ability to hold vacuum. • Key off, wait 10 seconds. • Disconnect vacuum line from MAP sensor. • Connect a vacuum pump to the MAP sensor and apply 18 in. Hg. (60 kPa) vacuum to MAP sensor. • **Does MAP sensor hold vacuum?**	Yes ▶	RELEASE vacuum. GO to H27 .
	No ▶	REMOVE vacuum pump. RECONNECT HEGO sensor. REPLACE MAP sensor. RERUN Quick Test.

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Fuel Control | Pinpoint Test | H

TEST STEP	RESULT ▶	ACTION TO TAKE
H27 CHECK FOR LOSS OF VACUUM TO MAP SENSOR		
• Tee a vacuum gauge into the manifold vacuum line at the MAP sensor • Start the engine and let rpm stabilize. Note vacuum level. • Key off, wait 10 seconds. • REMOVE vacuum gauge and tee and reconnect vacuum line to MAP sensor • Tee in vacuum gauge at a different source of intake manifold vacuum and restart the engine. Note vacuum level. • **Does the vacuum level differ greater than 1 in. Hg.?**	Yes ▶	REMOVE vacuum gauge and tee. RECONNECT HEGO sensor. INSPECT vacuum lines for leaks, holes, disconnections, kinks, blockages, and proper routing. SERVICE as necessary. RERUN Quick Test.
	No ▶	GO to H28 .

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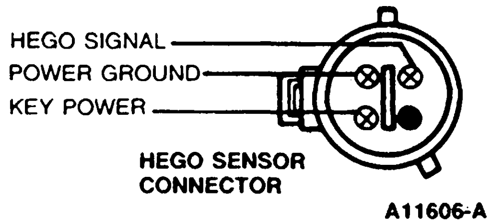
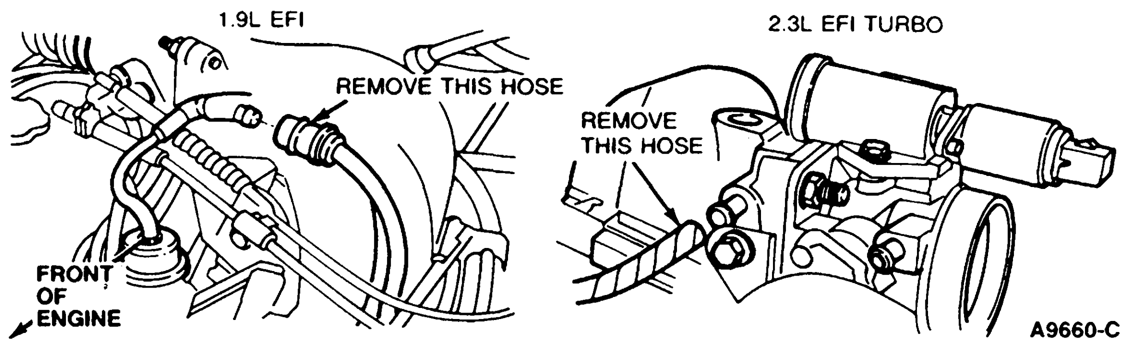
Fuel Control

Pinpoint Test H

TEST STEP	RESULT ▶	ACTION TO TAKE
H28 HEGO SENSOR CHECK		
• Key off, wait 10 seconds. • HEGO sensor disconnected. • Connect DVOM to HEGO SIGNAL at the HEGO sensor connector and to battery negative post. • DVOM on 20 volt scale. • Create a vacuum leak to cause HEGO sensor to go lean. **For 1.9L EFI and 2.3L EFI TC:** — Disconnect the manifold vacuum hose illustrated below. **For SEFI MA vehicles:** — Disconnect any vacuum hose from the manifold vacuum tree. **For all other applications:** — Disconnect the PCV valve hose from the PCV valve. • Start engine and run at approximately 2000 rpm. • **Does the DVOM indicate less than 0.4 volts within 30 seconds?**	Yes ▶	RECONNECT HEGO sensor and vacuum lines. HEGO sensor is OK. GO to H1.
	No ▶	RECONNECT vacuum hoses. REPLACE HEGO sensor. RERUN Quick Test.





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Fuel Control

Pinpoint Test H

H29 CONTINUOUS TESTING: CODE 41, OR 91

CODE 41/91 — Indicates that a HEGO circuit has not switched during closed loop fuel control.

NOTE: In this situation, Code 41/91 does not necessarily indicate a lean condition.

Before attempting to service a Continuous Memory Code 41 or 91, DIAGNOSE all other driveability complaints first. E.g., rough idle, misses, etc. in Quick Test Step 7.0.

NOTE: The Fuel Service Code may help to isolate the cause of the fuel control problem.

Some areas to check are:

- Unmetered Air (vacuum leaks/intake air leaks):
  - Canister purge system
  - PCV system
  - Engine sealing
  - Crimped fuel lines
  - Plugged fuel filter
  - Fouled fuel injectors
  - Air leaks between mass air flow sensor and air outlet tube to throttle body
- HEGO Fuel Fouled:

  Whenever an over-rich fuel condition has been experienced (fuel fouled spark plugs), make a thorough check of the ignition system. If a HEGO sensor is suspected of being fuel fouled (low output or slow response), run the vehicle at sustained high speed (within legal limits) followed by a few hard accels. This will burn off the HEGO contamination and restore proper HEGO operation.
- Ignition System:

  If engine is always in DEFAULT spark (base timing) refer to Quick Test Step [4.0].
- Improper Fueling:

  Lead fouled HEGO sensor.
- Fuel Pressure:

  Perform Pinpoint Test Steps [H1] and [H2].
- TP Sensor:

  Turn key to RUN position. While moving throttle slowly toward wide-open position, measure voltage between Test Pins 47 and 46 at the breakout box. If the voltage does not increase with the increase of throttle opening, replace TP sensor or linkage as necessary.
- If at this point the driveability concern is still present, perform Pinpoint Test Steps [H3] through [H6].

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Fuel Control

Pinpoint Test H

H30 CONTINUOUS TESTING: CODE 41, 42, 43, 65, 85, OR 86

CODE 41 — HEGO indicated the fuel system was lean for more than 15 seconds when the fuel system should have been in closed loop fuel control.

CODE 42 — HEGO indicated the fuel system was rich for more than 15 seconds when the fuel system should have been in closed loop fuel control.

CODE 43 — HEGO indicated the fuel system was lean at WOT for more than 3 seconds.

CODE 65 — Never went to closed loop fuel control on HEGO switching.

CODE 85 — Adaptive fuel has corrected an excessive rich condition. (Adaptive fuel made the fuel system leaner.)

CODE 86 — Adaptive fuel has corrected an excessive lean condition. (Adaptive fuel made the fuel system richer.)

- Before attempting to service a Continuous Memory Code 41, 42, 43, 65, 85, or 86, DIAGNOSE all other drivability complaints first. Examples: rough idle, misses, etc. in Quick Test Step 7.0.
- Whenever an over-rich fuel condition has been experienced (fuel fouled spark plugs), make a thorough check of the ignition system. If a HEGO sensor is suspected of being fuel fouled (low output or slow response), after the vehicle service, run the vehicle at sustained high speed (within legal limits) followed by a few hard accels. This will burn off the HEGO contamination and restore proper HEGO operation.
- The fuel Service Code may help to isolate the cause of the fuel control problem. Some areas to check are:

Code 41:

- Intermittant HEGO circuit (SIGNAL or GROUND).
- If Code 65 is also present, service faulty HEGO circuit (SIGNAL or GROUND).
- If Code 43 is also present, service Code 43 first.
- Airflow meter indicates low air flow. Check for vacuum leaks, intake air leaks, or a sticking air meter vane caused by contamination or frost.
- Low fuel pressure at WOT.
  - — Low-pressure fuel pump.
  - — Restricted fuel supply (crimped fuel lines or plugged fuel filter).
- Low fuel flow at WOT with correct fuel pressure.
  - — Clogged fuel injectors.
  - — Low battery (fuel injector voltage less than 11 volts).

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Fuel Control	Pinpoint Test	H

H30 (CONTINUED)

CODE 42:

- Intermittant HEGO circuit (SIGNAL or GROUND).
- Airflow indicated by the air meter is greater than the actual airflow (causing more fuel to be delivered than necessary). Check for high air meter voltage output due to a sticking air meter vane caused by contamination.
- Excessive fuel pressure. Check for fuel pressure regulator vacuum line disconnected or kinked fuel return line.
- Excessive fuel flow. Check for damaged or stuck open fuel injector(s).

BOTH CODES 41 and 42:

- Intermittant HEGO circuit (SIGNAL or GROUND).
- Sticking air meter vane due to contamination.
- Contaminated HEGO sensor (lead or silicone fouled).
- Improper fuel pressure. Check fuel pump and fuel pressure regulator.

CODE 43:

- Low fuel pressure at WOT.
  - — Low pressure fuel pump.
  - — Restricted fuel supply (crimped fuel lines or plugged filter).
- Low fuel flow at WOT with correct fuel pressure.
  - — Clogged fuel injectors.
  - — Low battery (fuel injector voltage less than 11 volts).

CODE 65:

- Check for faulty HEGO circuit (SIGNAL or GROUND).

CODE 85:

- If Code 42 is also present, service Code 42 first.
- Excessive fuel pressure. Check for fuel pressure regulator vacuum line disconnected or kinked fuel return line.
- Excessive fuel flow. Check for damaged fuel injector pintle or injectors stuck open.

CODE 86:

- If Code 41 is also present, service Code 41 first.
- Low fuel pressure
  - — Low pressure fuel pump.
  - — Restricted fuel supply (crimped fuel lines or plugged filter).
- Low fuel flow with correct fuel pressure
  - — Clogged fuel injectors.
  - — Low battery (fuel injector voltage less than 11 volts).

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Fuel Pump Circuit

Pinpoint Test **J**

Note

You should enter this Pinpoint Test only when a Service Code 87, 95 or 96 is received in Quick Test Step 3.0 or 6.0 or you are directed here from Pinpoint Test Step A or Quick Test Step 7.0.

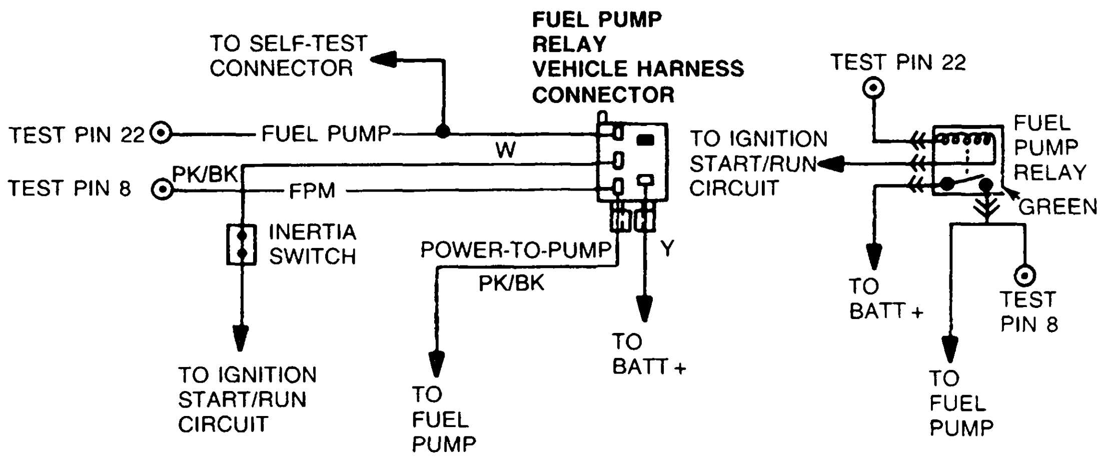
Remember

This Pinpoint Test is intended to diagnose only the following:

- Fuel Pump Relay (-9345-)
- Inertia Switch (-9341-)
- Harness Circuits: V BATT., VPWR, F.P., GROUND and POWER-TO-PUMP(s)
- Processor Assembly (-12A650-)

Pinpoint Test Schematic

1.9L CFI, 1.9L EFI, 2.3L HSC



A11532-B

Test Pin 22 Application	Fuel Pump Wire Color
1.9L CFI 1.9L EFI	T/LG
2.3L HSC	O/LB

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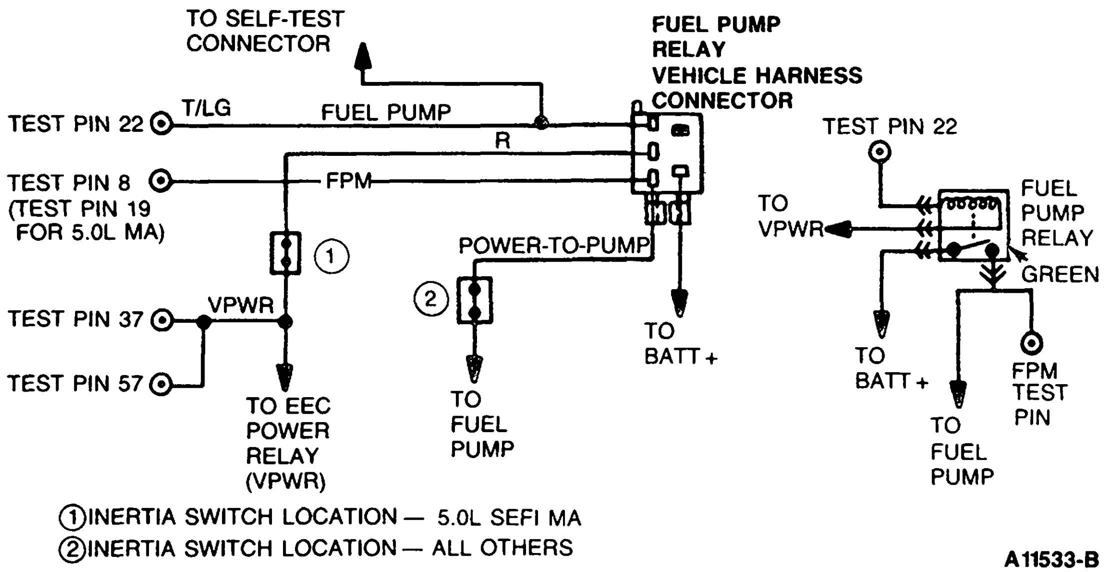
Fuel Pump Circuit

Pinpoint Test **J**

Pinpoint Test Schematic

5.0L SEFI MA, 2.3L EFI TRUCK, 2.9L EFI TRUCK, 3.0L EFI TRUCK



Test Pin 8 (19) **FPM**

Application	Wire Color
2.3L EFI Truck 2.9L EFI Truck 3.0L EFI Truck	O/LB
5.0L SEFI MA	PK/BK

POWER-TO-PUMP Circuit

Application	Wire Color
2.3L EFI Truck 3.0L EFI Truck	O/LB
2.9L EFI Truck 5.0L SEFI MA	PK/BK

BATT+

Application	Wire Color
2.3L EFI Truck 2.9L EFI Truck	BK/Y
3.0L EFI Truck	Y
5.0L SEFI MA	O/LB

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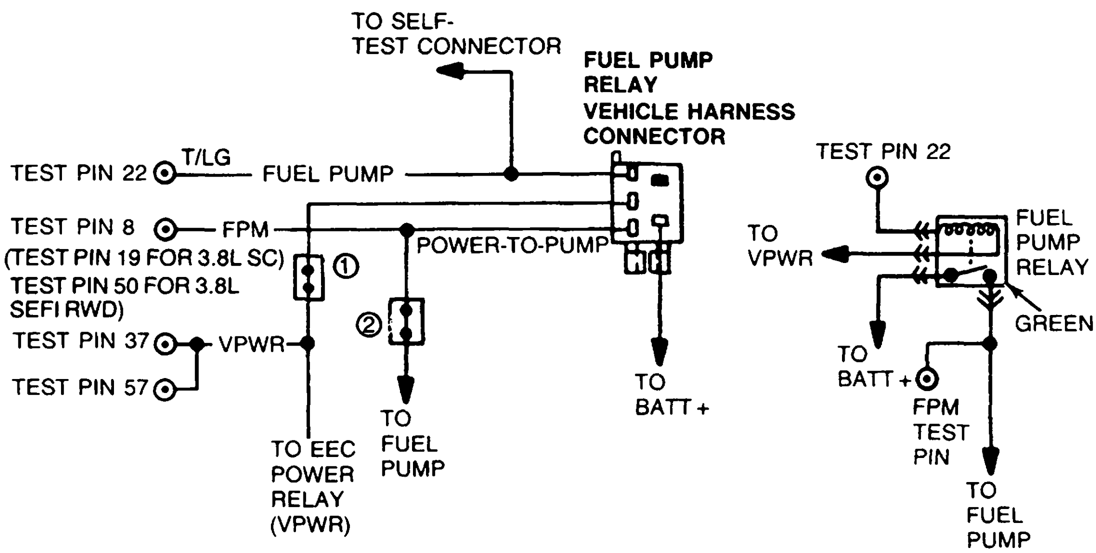
Fuel Pump Circuit

Pinpoint Test **J**

Pinpoint Test Schematic

3.8L SEFI RWD, 3.8L SEFI SC, 4.9L EFI, 5.0L EFI, 5.8L EFI, 7.5L EFI, TRUCKS



① INERTIA SWITCH LOCATION—THUNDERBIRD/COUGAR
② INERTIA SWITCH LOCATION—F-SERIES, E-SERIES, BRONCO

A11534-B

TEST PIN 8 (19, 50)
POWER-TO-PUMP Circuit

Application	Wire Color
F-Series Bronco	BR
E-Series	O/LB
Thunderbird/Cougar	PK/BK

BATT+ At Relay

Application	Wire Color
F-Series E-Series Bronco	Y
Thunderbird/Cougar	BK/Y

VPWR At Relay

Application	Wire Color
F-Series E-Series Bronco	R
Thunderbird/Cougar	W

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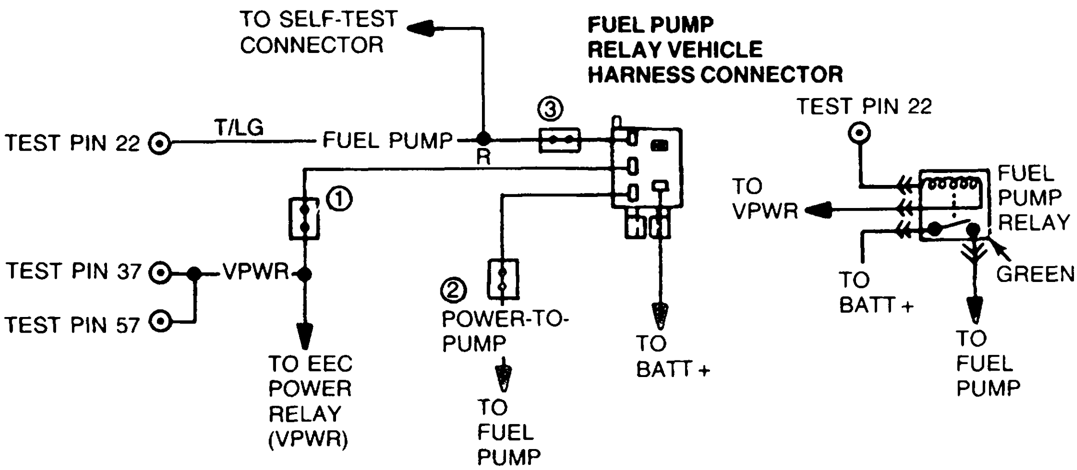
Fuel Pump Circuit

Pinpoint Test J

Pinpoint Test Schematic

2.3L OHC EFI CAR, 5.0L SEFI



① INERTIA SWITCH LOCATION — MUSTANG
② INERTIA SWITCH LOCATION—CROWN VICTORIA/ GRAND MARQUIS, TOWN CAR
③ INERTIA SWITCH LOCATION — MARK VII

A11535-B

POWER-TO-PUMP Circuit

Application	Wire Color
Crown Victoria/Grand Marquis, Town Car	O
Mustang Mark VII	PK/BK

BATT+ At Relay

Application	Wire Color
Crown Victoria/Grand Marquis, Town Car	Y
Mustang	O/LB
Mark VII	R

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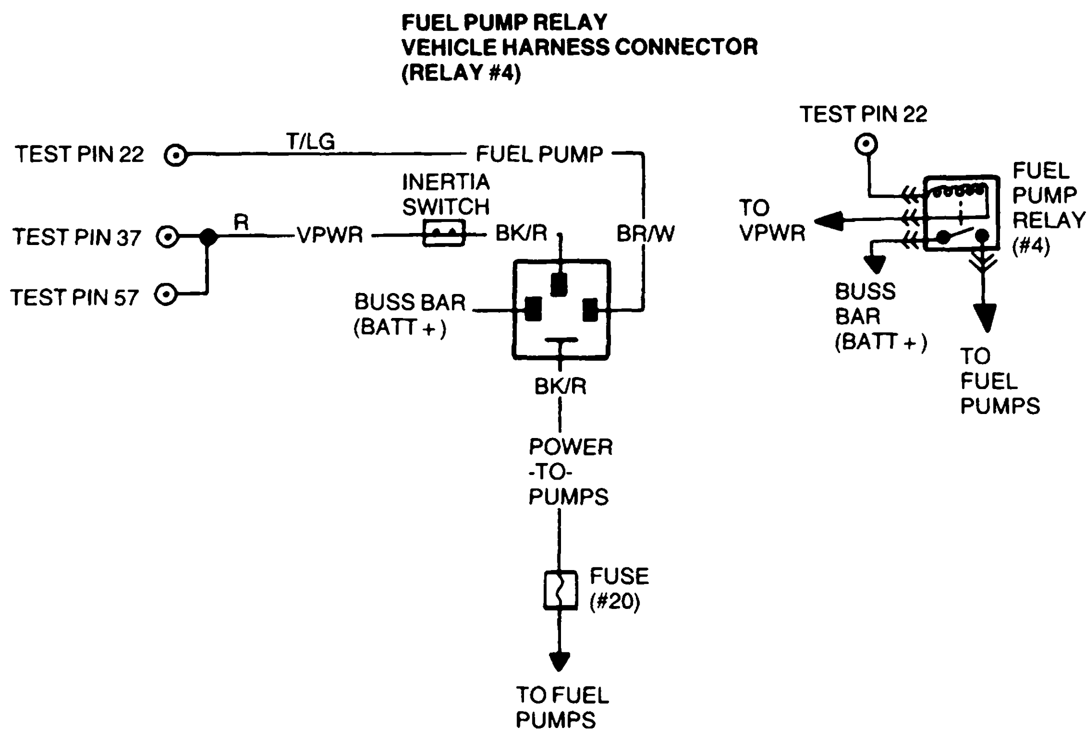
Fuel Pump Circuit	Pinpoint Test	J

Pinpoint Test Schematic

2.3L EFI TC



A8913-A

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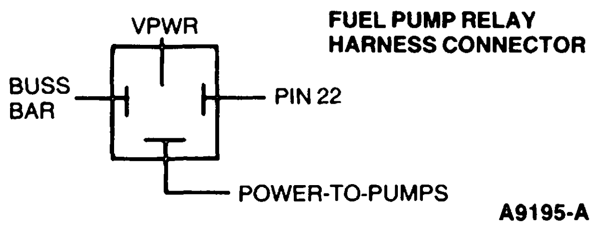
Fuel Pump Circuit

Pinpoint Test J

TEST STEP		RESULT	ACTION TO TAKE
J1	NO FUEL PUMP PRESSURE: CHECK FOR FUEL PUMP ELECTRICAL OPERATION		
	• To check if fuel pump runs, cycle key from Off to Run, repeat several times. (Do not enter start mode.) • **Does fuel pump run briefly each time the key enters run?**	Yes ▶	GO to Section 11. Also REFER to Shop Manual, Group 24 electric fuel pump.
		No ▶	GO to J2.
J2	CHECK FOR VPWR TO PROCESSOR		
	• Key off. • Breakout box installed, processor connected. • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between Test Pin 37 and Test Pin 40 at the breakout box and between Test Pin 57 and Test Pin 60 at the breakout box. • **Are both voltages greater than 10.5 volts?**	Yes ▶	2.3L EFI TC GO to J3. ALL OTHERS, GO to J5.
		No ▶	GO to B1.
J3	CHECK CONTINUITY BETWEEN FUEL PUMP RELAY AND FUEL CIRCUIT FUSE		
	• Key off. • Breakout box installed, processor connected. • Disconnect fuel pump relay. • Disconnect fuel pump circuit fuse (#20). • DVOM on 200 ohm scale. • Measure resistance from the POWER-TO-PUMPS circuit at fuel pump relay harness connector to relay side of fuse harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶	GO to J4.
		No ▶	SERVICE open between fuel pump relay and fuel pump circuit fuse (#20). REMOVE breakout box and RECONNECT components. RE-EVALUATE symptom.



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Fuel Pump Circuit — Pinpoint Test J

TEST STEP	RESULT ▶	ACTION TO TAKE
J4 CHECK FOR VOLTAGE TO POWER-TO-PUMPS CIRCUIT		
• Key off. • Breakout box installed, processor connected. • Fuel pump circuit fuse (#20) disconnected. • Reconnect fuel pump relay. • DVOM on 20 volt scale. • Measure voltage between relay side of fuel pump circuit fuse and chassis ground during crank mode. • **Is voltage greater than 8.0 volts during crank?**	Yes ▶	GO to Section 11 for open in POWER-TO-PUMPS circuit, fuel pump ground, open in pump etc. Also, REFER to Shop Manual, Group 24.
	No ▶	GO to [J6].
J5 CHECK FOR VOLTAGE TO POWER-TO-PUMP(S) CIRCUIT		
• Key on, engine off. • Breakout box installed, processor connected. • Locate fuel pump relay. • DVOM on 20 volt scale. • Measure voltage between chassis ground and POWER-TO-PUMP(s) circuit at fuel pump relay during crank mode. • **Is voltage greater than 8.0 volts during crank?**	Yes ▶	GO to Section 11 for open in POWER-TO-PUMP circuit, fuel pump GND, open in pump, etc. Also REFER to Shop Manual, Group 24.
	No ▶	GO to [J6].
J6 CHECK FOR BATT+ TO FUEL PUMP RELAY		
• Key on, engine off. • Breakout box installed, processor connected. • Locate fuel pump relay. • DVOM on 20 volt scale. • Measure voltage between chassis ground and BATT+ at the fuel pump relay. • **Is voltage greater than 10.5 volts?**	Yes ▶	1.9L EFI and 2.3L EFI TC. GO to [J7]. ALL OTHERS, GO to [J11].
	No ▶	SERVICE open in BATT+ between fuel pump relay and vehicle battery positive post. RERUN Quick Test.

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Fuel Pump Circuit — Pinpoint Test J

TEST STEP	RESULT ▶	ACTION TO TAKE
J7 CHECK FOR VPWR TO FUEL PUMP RELAY		
Service Code 87 indicates a fuel pump primary circuit failure. Possible causes are: — Inertia switch not reset or electrically open (if in primary circuit) — Open or shorted circuit — Faulty fuel pump relay — Faulty processor o Key on, engine off. o Breakout box installed, processor connected. o Locate fuel pump relay. o DVOM on 20 volt scale. o Measure voltage between chassis ground and VPWR circuit (Ignition start/run circuit for 1.9L EFI, 1.9L CFI and 2.3L HSC) at the fuel pump relay. o **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to J8. VERIFY inertia switch is reset to On. If switch will not reset, REPLACE switch. If OK. — 1.9L EFI, 1.9L CFI and 2.3L HSC, SERVICE open between ignition switch start/run circuit and fuel pump relay. — All others, SERVICE open in VPWR circuit between the EEC power relay and the fuel pump relay. RERUN Quick Test.
J8 CHECK CONTINUITY OF FUEL PUMP CIRCUIT		
o Key off, wait 10 seconds. o Breakout box installed, processor connected. o DVOM on 200 ohm scale. o Measure resistance between fuel pump circuit at the fuel pump relay and Test Pin 22 at the breakout box. o **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to J9. SERVICE open circuit. RERUN Quick Test.
J9 CHECK FOR SHORT TO POWER		
o Key on. o Breakout box installed. o Disconnect processor. o Disconnect fuel pump relay. o DVOM on 20 volt scale. o Measure voltage between Test Pin 22 and battery negative post. o **Is voltage less than 1.0 volt?**	Yes ▶ No ▶	GO to J10. SERVICE short circuit. RECONNECT processor, ATTEMPT to start vehicle. If vehicle fails to start, REPLACE processor. RERUN Quick Test.

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Fuel Pump Circuit

Pinpoint Test J

TEST STEP	RESULT ▶	ACTION TO TAKE
J10 CHECK FOR SHORT TO GROUND		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • Fuel pump relay disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 22 and Test Pins 40 and 60 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	RECONNECT fuel pump relay. GO to J11. SERVICE short circuit. RERUN Quick Test.
J11 CHECK FOR VOLTAGE AT POWER-TO-PUMP(S) CIRCUIT		
• Breakout box installed, processor disconnected. • Connect jumper wire from Test Pin 22 to Test Pin 40 or 60 at the breakout box. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between chassis ground and POWER-TO-PUMP(s) circuit at fuel pump relay. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	REPLACE processor. RERUN Quick Test. REPLACE fuel pump relay. RECONNECT processor and RERUN Quick Test.
J20 SERVICE CODE 95: CHECK INERTIA SWITCH		
NOTE: Service Code 95 indicates that one of the following has occurred: **— Inertia switch not reset or electrically open (if in secondary circuit).** **— Open circuit in or between the fuel pump and FPM circuit at the processor** **— Poor fuel pump ground** **— Fuel pump secondary circuit short to power** **— Fuel pump relay contacts always closed** **— Faulty processor** • Key off, wait 10 seconds. • Locate and disconnect fuel pump inertia switch (verify that switch is reset). • DVOM on 200 ohm scale. • Measure resistance of the fuel pump inertia switch. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	RECONNECT inertia switch. GO to J21. REPLACE or RESET inertia switch. RERUN Quick Test.

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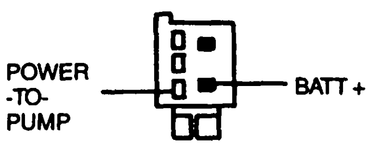
Fuel Pump Circuit

Pinpoint Test J

TEST STEP	RESULT ▶	ACTION TO TAKE
J21 VERIFY THAT FUEL PUMP IS OFF		
• Key off. • Listen for motor noise from fuel pump. • **Is fuel pump off?**	Yes ▶ No ▶	GO to J23. GO to J22.
J22 CHECK FOR FUEL PUMP RELAY ALWAYS CLOSED		
• Key off. • Locate and disconnect fuel pump relay. • **Does fuel pump shut off when relay is disconnected?**	Yes ▶ No ▶	REPLACE fuel pump relay. RERUN Quick Test. SERVICE short to power in POWER-TO-PUMP/FPM circuit. RERUN Quick Test.
J23 CHECK CONTINUITY OF FPM CIRCUIT		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Disconnect fuel pump relay. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 8 (Test Pin 19 for 5.0L MA, 3.8L SC; Test Pin 50 for 3.8L SEFI RWD) at the breakout box and POWER-TO-PUMP circuit at the fuel pump relay vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to J24. REMOVE breakout box. RECONNECT processor and fuel pump relay. SERVICE open circuit. RERUN Quick Test.



FUEL PUMP RELAY
VEHICLE HARNESS
CONNECTOR

A9196-A

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Fuel Pump Circuit

Pinpoint Test **J**

TEST STEP	RESULT ▶	ACTION TO TAKE
J24 CHECK FOR CONTINUITY BETWEEN FPM CIRCUIT AND GROUND		
• Key off. • Breakout box installed, processor disconnected. • Fuel pump relay disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 8 (Test Pin 19 for 5.0L MA, 3.8L S/C; Test Pin 50 for 3.8L SEFI RWD) at the breakout box and battery negative post. • **Is resistance less than 10.0 ohms?**	Yes ▶	For 1.9L EFI, RECONNECT fuel pump relay and GO to J25 . ALL OTHERS, REMOVE breakout box. RECONNECT fuel pump relay. REPLACE processor. RERUN Quick Test.
	No ▶	REMOVE breakout box. RECONNECT fuel pump relay and processor. GO to Shop Manual Group 24, (Group 10 for Compact Truck) Electric Fuel Pump for open in POWER-TO-PUMP circuit, poor fuel pump GROUND, open in fuel pump, etc.
J25 CHECK FUEL PUMP PRIMARY CIRCUIT FOR SHORT TO GROUND		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • Fuel pump relay disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 22 and Test Pin 40 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶	REMOVE breakout box. RECONNECT fuel pump relay. REPLACE processor RERUN Quick Test.
	No ▶	REMOVE breakout box. RECONNECT processor and fuel pump relay. SERVICE short circuit. RERUN Quick Test.

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Fuel Pump Circuit

Pinpoint Test J

TEST STEP	RESULT ▶	ACTION TO TAKE
J30 SERVICE CODE 96: CHECK FOR BATT+ TO FUEL PUMP RELAY		
Service Code 96 indicates a fuel pump secondary circuit failure between the BATT+ supply and the FPM connection to the POWER-TO-PUMP circuit. Possible causes are: — Open circuit — Faulty fuel pump relay — Faulty processor ∘ Key off, wait 10 seconds. ∘ Locate fuel pump relay. ∘ DVOM on 20 volt scale. ∘ Measure voltage between BATT+ circuit at the fuel pump relay and battery negative post. ∘ **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to J31 . SERVICE open in BATT+ circuit. RERUN Quick Test.
J31 CHECK FOR VOLTAGE AT POWER-TO-PUMP CIRCUIT TO VERIFY FUEL PUMP RELAY OPERATION		
∘ Key off. ∘ DVOM on 20 volt scale. ∘ Connect DVOM between POWER-TO-PUMP circuit at the fuel pump relay and battery negative post. ∘ Observe DVOM as you activate fuel pump relay (turn key to run for 1 second, then to off for 10 seconds. Repeat 5 times). ∘ **Does voltage measure greater than 10.5 volts for about 1 second after key is turned to RUN position during test?**	Yes ▶ No ▶	3.8L SEFI RWD, 3.8L SEFI SC, 4.9L EFI, 5.0L EFI, 5.8L EFI and 7.5L EFI Trucks GO to J32 . All others REPLACE processor. RERUN Quick Test. DISCONNECT fuel pump relay. INSPECT for damaged pins, corrosion, loose wires, etc. If OK REPLACE fuel pump relay. RERUN Quick Test.

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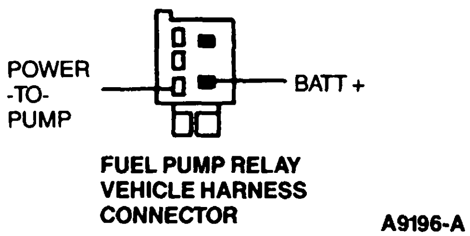
Fuel Pump Circuit

Pinpoint Test J

TEST STEP		RESULT ▶	ACTION TO TAKE
J32	CHECK CONTINUITY OF POWER-TO-PUMP CIRCUIT		
	• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Disconnect Fuel Pump Relay. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 8 (Test Pin 19 for 3.8L SC and Test Pin 50 for 3.8L SEFI RWD) at the breakout box and POWER-TO-PUMP circuit at the fuel pump relay vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶	REMOVE breakout box. RECONNECT fuel pump relay. REPLACE processor. RERUN Quick Test.
		No ▶	SERVICE open in POWER-TO-PUMP circuit between FPM splice and fuel pump relay. REFER to schematic. RERUN Quick Test.



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Fuel Pump Circuit

Pinpoint Test J

TEST STEP	RESULT ▶	ACTION TO TAKE
J90 CONTINUOUS MEMORY CODE 95: CHECK EEC-IV HARNESS		
A Continuous Memory Code 95 indicates that one of the following intermittent conditions has occurred: — Open circuit in or between the fuel pump and FPM circuit at the processor (see schematic) — Poor fuel pump ground — FPM or POWER-TO-PUMP circuit short to power. — Fuel pump relay contacts stuck closed. — Fuel pump circuit activated when processor expected circuit to be off (i.e. fuel system test or prime procedure). o Start engine. o Check for engine stall/stumble while performing the following (also, if possible, listen for fuel pump turning off.) — Shake, wiggle, bend the POWER-TO-PUMP circuit between the POWER-TO-PUMP pin at the fuel pump relay and the fuel pump. — Shake, wiggle, bend the fuel pump ground circuit from the fuel pump to ground. — Lightly tap the fuel pump to simulate road shock. — For vehicles with the inertia switch in the POWER-TO-PUMP circuit (refer to schematic), lightly tap inertia switch to simulate road shock. o Key off. o Inspect the fuel pump harness connector and the fuel pump ground for corrosion, damaged pins, etc. o **Is fault indicated/found?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test. GO to J91.

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Fuel Pump Circuit

Pinpoint Test J

TEST STEP	RESULT ▶	ACTION TO TAKE
J91 CHECK FPM CIRCUIT		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Key on, engine off. • Connect a TEST LAMP between Test Pin 8 (Test Pin 19 for 5.0L MA, 3.8L SC; Test Pin 50 for 3.8L SEFI RWD.) and Test Pin 37. • Observe test lamp for an indication of a fault while performing the following (The light will go out when a fault is found, indicating an open): — Shake, wiggle, bend the fuel pump monitor circuit between the fuel pump relay (or splice if applicable, see schematic) and the processor. • **Is fault indicated?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. REMOVE breakout box. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test. GO to J92 .
J92 CHECK FOR SHORTS TO POWER		
• Key on, engine off. • Breakout box installed, processor disconnected. • Connect TEST LAMP between Test Pin 8 (Test Pin 19 for 5.0L MA, 3.8L SC; Test Pin 50 for 3.8L SEFI RWD) and Test Pin 40. • Observe test lamp for an indication of a fault while performing the following (The light will turn on when a fault is detected, indicating a short to power. Also, if possible, listen for fuel pump turning on.): — Shake, wiggle, bend the fuel pump monitor circuit and POWER-TO-PUMP circuit, especially where they may be in the vicinity of a power circuit. • Lightly tap the fuel pump relay (to simulate road shock). • ***Is fault indicated?***	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. REMOVE breakout box. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test. Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.

* Can be purchased as a separate item.

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Fuel Pump Circuit

Pinpoint Test J

TEST STEP		RESULT ▶	ACTION TO TAKE
J93	CONTINUOUS MEMORY CODE 96: CHECK FOR CONTINUOUS MEMORY CODE 87		
	o **Is Continuous Memory Code 87 also present?**	Yes ▶	GO to J95 .
		No ▶	GO to J94 .
J94	CHECK EEC-IV HARNESS		
	A Continuous Memory Code 96, without the presence of a Continuous Memory Code 87, indicates that during vehicle operation, one of the following has occurred: — Open in the BATT+ circuit between BATT+ and the fuel pump relay. — Fuel pump relay contacts opened. — Open in the POWER-TO-PUMP circuit from the fuel pump relay to the FPM splice, if applicable (see schematic). o Start engine. o Check for engine stall/stumble while performing the following (also, if possible, listen for fuel pump turning off): — Shake, wiggle, bend the BATT+ circuit from BATT+ to the fuel pump relay. — Lightly tap the fuel pump relay (to simulate road shock). — Shake, wiggle, bend the POWER-TO-PUMP circuit from the fuel pump relay to the FPM splice, if applicable (See schematic). o Key off. o Inspect the fuel pump relay connectors and BATT+ connector terminal for corrosion, damaged pins, etc. o **Is fault indicated/found?**	Yes ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.
		No ▶	1.9L EFI: GO to J95 . All others, unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.

* Can be purchased as a separate item.

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Fuel Pump Circuit

Pinpoint Test J

TEST STEP	RESULT ▶	ACTION TO TAKE
J95 CONTINUOUS MEMORY CODE 87: CHECK EEC-IV HARNESS		
A Continuous Memory Code 87 indicates that a fuel pump primary circuit failure has occurred during vehicle operation. Possible causes are: — Open in VPWR circuit between the EEC power relay and the fuel pump relay. — Open coil in fuel pump relay. — Open in fuel pump circuit (pin 22). — Faulty inertia switch • Start engine. • Check for engine stall/stumble while performing the following (also, if possible, listen for fuel pump turning off): — Shake, wiggle, bend the VPWR circuit between the EEC power relay and the fuel pump relay. For vehicles with the inertia switch in the VPWR circuit (refer to schematic), lightly tap the inertia switch to simulate road shock. — Shake, wiggle, bend the EEC-IV harness fuel pump circuit (Test Pin 22) between the processor and the fuel pump relay. — Lightly tap the fuel pump relay to simulate road shock. • Key off. • Inspect the processor 60 pin connector and the fuel pump relay connectors for corrosion, damaged pins, etc. • **Is fault indicated/found?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test. Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.

* Can be purchased as a separate item.

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EGR On/Off Control | Pinpoint Test | KA

Note

You should enter this Pinpoint Test only when a Service Code 34 is received in Quick Test Step 5.0 or when directed here from Quick Test Step 7.0.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

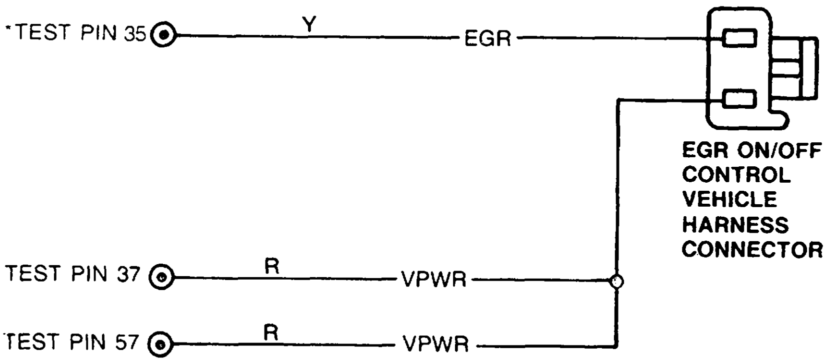
- Air or Vacuum Leaks
- EGR Flow Restrictions
- EGR Value

NOTE: Code 34 may be the result of high volume exhaust vent system (reduces back pressure). If this is suspected, perform the test in a well-ventilated area without exhaust vent connected.

This Pinpoint Test is intended to diagnose only the following:

- Circuits: EGR and VPWR
- EGR Solenoid (-9D474-)
- Presence of Manifold Vacuum
- Processor Assembly (-12A650-)

Pinpoint Test Schematic



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

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EGR On/Off Contr

Attach to page 17-225 of: Engine/Emissions Diagnosis Manual
- Refer to TSB 93-26B-15 for New Step KA1 For Checking Validity Of KOER Code 34

KA

TEST STEP	RESULT ▶	ACTION TO TAKE
KA1 SERVICE CODE 34: ENTER OUTPUT STATE CHECK (REFER TO QUICK TEST APPENDIX)		
Service code 34 (KOER) indicates that with engine rpm elevated and stabilized, a specified rpm drop did not occur when EGR is cycled on. Possible causes: — Faulty EGR On/Off control solenoid — Faulty EGR solenoid — Faulty EGR vent solenoid — Faulty EVP sensor — Faulty wire harness — Faulty processor — Manifold vacuum line blockage and/or leak **NOTE: Do not use STAR tester for this step, use a VOM/DVOM.** • Key off, wait 10 seconds. • DVOM on 20 volt scale. • Connect DVOM negative test lead to STO at the Self-Test connector and positive test lead to battery positive. • Jumper STI to SIGNAL RETURN at the Self-Test connector. • Rerun Key On Engine Off Self-Test until the completion of the Continuous Test Codes. • DVOM will indicate less than 1.0 volts. • Depress and release the throttle. • **Did DVOM reading change to a high voltage reading?**	Yes ▶ No ▶	REMAIN in Output State Check. GO to KA2. DEPRESS throttle to WOT and release. If STO voltage does not go high, GO to Pinpoint Test Step QC1. Leave equipment hooked up.
KA2 CHECK EGR ON/OFF CONTROL SOLENOID ELECTRICAL OPERATION		
• DVOM on 20 volt scale. • Connect DVOM positive test lead to VPWR circuit on EGR solenoid and negative test lead to EGR output circuit. • While observing DVOM, depress and release the throttle several times to cycle output on and off. • **Does EGR output cycle on and off?**	Yes ▶ No ▶	GO to KA3. REMOVE STI jumper. GO to KA5.

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EGR On/Ol	Attach to page **17-226** of: **Engine/Emissions Diagnosis Manual** - Refer to TSB **93-26B-15** for **New Step KA1 For Checking Validity Of KOER Code 34**	point est	KA

TEST STEP	RESULT	ACTION TO TAKE
KA3 CHECK SOLENOID FOR VACUUM CYCLING		
o Install vacuum pump to the solenoid vacuum supply port and install a vacuum gauge to the output port. Apply 6 in-Hg minimum. o While cycling outputs on and off (by depressing and releasing throttle) observe the vacuum gauge at the output. **NOTE: Maintain vacuum at source.** o **Does output port vacuum cycle on and off?**	Yes No	GO to KA4. REPLACE solenoid. RERUN Quick Test.
KA4 CHECK MANIFOLD VACUUM LINES FOR BLOCKAGE OR LEAKS		
o Vacuum lines disconnected at solenoid. o Start engine. o Check for vacuum. o **Is vacuum present?**	Yes No	EEC-IV system OK. GO to Section 6. SERVICE vacuum source blockage or leak. RERUN Quick Test.
KA5 MEASURE EGR SOLENOID RESISTANCE		
o Key off, wait 10 seconds. o DVOM on 200 ohm scale. o Disconnect EGR solenoid. o Measure solenoid resistance. o **Is resistance between 65 and 110 ohms?**	Yes No	GO to KA6. REPLACE EGR solenoid. RERUN Quick Test.
KA6 CHECK VOLTAGE OF VPWR CIRCUIT		
o Key on, engine off. o EGR solenoid disconnected. o DVOM on 20 volt scale. o Measure voltage between VPWR circuit at the EGR solenoid vehicle harness connector and battery ground. o **Is voltage greater than 10.5 volts?**	Yes No	GO to KA7. RECONNECT EGR solenoid. SERVICE open circuit. RERUN Quick Test.

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EGR On/Off Con

Attach to page **17-227** of: **Engine/Emissions Diagnosis Manual** - Refer to TSB **93-26B-15** for **New Step KA1 For Checking Validity Of KOER Code 34**

KA

TEST STEP	RESULT ▶	ACTION TO TAKE
KA7 CHECK CONTINUITY OF EGR CIRCUIT		
• Key off, wait 10 seconds. • EGR solenoid disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 35 at the breakout box and EGR circuit at vehicle harness connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to KA8 . REMOVE breakout box. RECONNECT all components. SERVICE open circuit. RERUN Quick Test.
KA8 CHECK FOR SHORT TO GROUND		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • EGR solenoid disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 35 and Test Pins 40, 46 and 60 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to KA9 . REMOVE breakout box. RECONNECT all components. SERVICE short circuit. RERUN Quick Test.
KA9 CHECK FOR SHORT TO POWER		
• Key off, wait 10 seconds. • DVOM on 200,000 ohm scale. • Breakout box installed, processor disconnected. • EGR solenoid disconnected. • Measure resistance between Test Pin 35 and Test Pins 37 and 57 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT all components. REPLACE Processor. RERUN Quick Test. REMOVE breakout box. RECONNECT all components. SERVICE short to power. RERUN Quick Test. If code is repeated, REPLACE processor.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test **KB**

Note

You should enter this Pinpoint Test only when a Service Code 12, 13, 16, 17, 19, 23, 38, 53, 58, 63, 68, 71, 73 or 93 is received in Quick Test Step 3.0, 5.0, or 6.0 or when directed here from Quick Test Step 7.0.

Remember

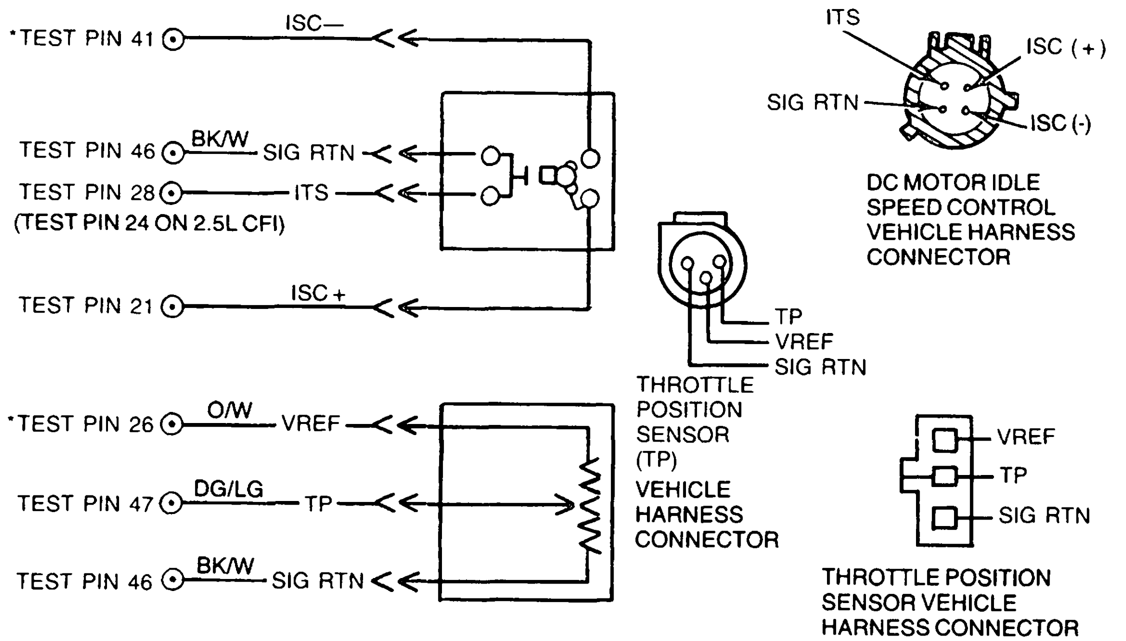
To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Throttle stop screw out of adjustment
- Basic engine
- Vacuum leaks
- Throttle sticking

This Pinpoint Test is intended to diagnose only the following:

- DC motor/Idle tracking switch assembly (-9N825-)
- Harness circuits ISC+, ISC−, ITS, TP, VREF, and, SIG RTN
- Throttle position sensor (-9B989-)
- EEC-IV processor assembly (-12A650-)

Pinpoint Test Schematic



***TEST PINS LOCATED ON THE BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9918-C

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test KB

Idle Tracking Switch Circuit

1.9L CFI	Pin 28	LG/W
2.5L CFI	Pin 24	W/R

Test Pin 21	ISC+
1.9L CFI	BR/W
2.5L CFI	Y/BK

Test Pin 41	ISC -
1.9L CFI	W/LB
2.5L CFI	W

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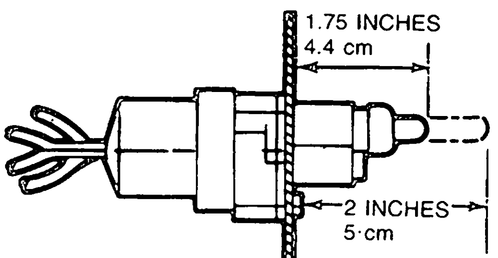
DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test | **KB**

TEST STEP	RESULT ▶	ACTION TO TAKE
KB1 SERVICE CODE 13: CHECK DC MOTOR FOR PROPER OPERATION		
Service Code 13 indicates that an idle speed control rpm management error exists. The engine did not return to a specified lower rpm prior to entering the "goose" test portion of the Self-Test. Possible causes: — Faulty DC motor — Open circuit in the idle speed control circuits — Short to ground in the idle speed control circuits — Short to power in the idle speed control circuits — Faulty processor ∘ Key off, wait 10 seconds. ∘ Disconnect harness from DC motor. ∘ Jumper ISC+ circuit of DC motor to battery positive and ISC – circuit of DC motor to battery ground for 4 seconds. ∘ Jumper ISC+ circuit of DC motor to battery ground and ISC – circuit of DC motor to battery positive for 4 seconds. ∘ **Does the DC motor shaft extend greater than 2 inches (5 cm) and retract less than 1.75 inches (4.4 cm) from mounting bracket (see below)?**	Yes ▶ No ▶	GO to KB2. REPLACE DC MOTOR. RERUN Quick Test.



A9919-B

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test **KB**

TEST STEP	RESULT ▶	ACTION TO TAKE
KB2 CHECK CONTINUITY OF ISC+ AND ISC− CIRCUITS		
• Key off, wait 10 seconds. • Harness disconnected from DC motor. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 41 at the breakout box and ISC − circuit at the vehicle harness connector and between Test Pin 21 at the breakout box and ISC+ circuit at the vehicle harness connector. • **Are both resistances less than 5 ohms?**	Yes ▶ No ▶	GO to KB3. REMOVE breakout box. RECONNECT all components. SERVICE OPEN circuit(s). RERUN Quick Test.
KB3 CHECK FOR SHORTS TO GRND OF ISC+ AND ISC− CIRCUITS		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • Harness disconnected from DC motor. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 41 and Test Pins 40, 46 and 60 at the breakout box. • Measure resistance between Test Pin 21 and Test Pins 40, 46 and 60 at the breakout box. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to KB4. REMOVE breakout box. RECONNECT all components. SERVICE short circuit(s). RERUN Quick Test.
KB4 CHECK FOR SHORTS TO PWR. OF ISC+ AND ISC− CIRCUITS		
• Key on, engine off. • Breakout box installed, processor disconnected. • Harness disconnected from DC motor. • DVOM on 20 volt scale. • Measure voltage between Test Pin 41 and Test Pin 40 and 60 at the breakout box. • Measure voltage between Test Pin 21 and Test Pins 40 and 60 at the breakout box. • **Are all voltages less than 1 volt?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT all components. REPLACE processor. RERUN Quick Test. REMOVE breakout box. RECONNECT all components. SERVICE short circuit(s). RERUN Quick Test.

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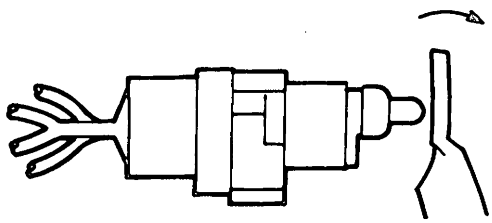
DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test KB

TEST STEP	RESULT ▶	ACTION TO TAKE
KB5 SERVICE CODE 58: CHECK FOR FULL DC MOTOR RETRACTION		
Service Code 58 indicates that the DC motor shaft does not make contact with the throttle lever when the idle speed control DC motor produces a signal to extend the shaft. Possible causes: — Open in the idle tracking switch circuit — Faulty DC motor — Faulty processor o Key off, wait 10 seconds. o Disconnect harness from DC motor. o Jumper, at the DC motor connector, ISC – circuit to battery positive and the ISC+ circuit to battery negative for 4 seconds. o **Does the DC motor shaft retract away from the throttle lever as shown?**  A9674-B	Yes ▶ No ▶	GO to KB7. GO to KB6.
KB6 MEASURE DC MOTOR RETRACTION		
o Key off, wait 10 seconds. o Harness disconnected from DC motor. o DC motor fully retracted. o Measure the distance from the tip of the DC motor shaft to the mounting bracket. Refer to figure in Step KB1. o **Is the distance less than 1.75 inches (4.4 cm)?**	Yes ▶ No ▶	RECONNECT DC motor. GO to Section 4 for throttle stop adjustment procedure. REPLACE DC motor. RERUN Quick Test.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test KB

TEST STEP	RESULT ▶	ACTION TO TAKE
KB7 CHECK IDLE TRACKING SWITCH STATE		
• Key off, wait 10 seconds. • Harness disconnected from DC motor. • DC motor fully retracted. • DC motor shaft **NOT** touching the throttle lever. • DVOM on 200 ohm scale. • Measure resistance between ITS circuit and SIG RTN at the DC motor connector. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to KB8. REPLACE DC motor. RERUN Quick Test.
KB8 CHECK CONTINUITY OF ITS AND SIG RTN CIRCUITS		
• Key off, wait 10 seconds. • Harness disconnected from DC motor. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion or loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 46 at the breakout box and SIG RTN circuit at the DC motor vehicle harness connector. • Measure resistance between Test Pin 28 (Test Pin 24 on 2.5L CFI) at the breakout box and ITS circuit at the DC motor vehicle harness connector. • **Are both resistances less than 5 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT all components. RECONNECT DC motor. REPLACE processor. RERUN Quick Test. REMOVE breakout box. RECONNECT all components. RECONNECT DC motor. SERVICE open circuit(s). RERUN Quick Test.
KB9 SERVICE CODE 68: CHECK IDLE TRACKING SWITCH STATE		
Service Code 68 indicates that the DC motor shaft is in contact with the throttle lever when the idle speed control DC motor produces a signal to retract the shaft. Possible causes: — Faulty DC motor — Short to ground in the idle tracking switch circuit — Faulty processor • Key off, wait 10 seconds. • Disconnect harness from DC motor. • DVOM on 200 ohm scale. • Measure resistance between ITS circuit and SIG RTN circuit at the DC motor connector. • **Is the resistance greater than 5 ohms?**	Yes ▶ No ▶	GO to KB10. REPLACE DC motor. RERUN Quick Test.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test KB

TEST STEP	RESULT ▶	ACTION TO TAKE
KB10 CHECK ITS CIRCUIT FOR SHORTS TO GND		
o Key off, wait 10 seconds. o Harness disconnected from DC motor. o Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o Install breakout box, leave processor disconnected. o Measure resistance between Test Pin 28 (Test Pin 24 on 2.5L CFI) and Test Pins 40, 46 and 60 at the breakout box. o **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT all components. RECONNECT DC motor. REPLACE processor. RERUN Quick Test. REMOVE breakout box. RECONNECT all components. RECONNECT DC motor. SERVICE faulty circuit(s). RERUN Quick Test.
KB11 SERVICE CODE 93: CHECK THROTTLE LEVER AND LINKAGE		
Service Code 93 indicates that the DC motor is not properly interacting with the throttle linkage. Possible cause: — Faulty DC motor o Key off, wait 10 seconds. o Inspect throttle for freedom of movement to wide-open throttle and for damaged or bent throttle lever. o **Is throttle/throttle linkage functioning properly?**	Yes ▶ No ▶	REPLACE DC motor. RERUN Quick Test. SERVICE as necessary. RERUN Quick Test.
KB12 CHECK THROTTLE PLATE FOR CLOSING		
Service Code 23 indicates that the throttle plate is not in the proper position during Self-Test. Possible causes: — Faulty throttle position sensor — Open in throttle position sensor circuit — Faulty processor o Run Key On Engine Off Self-Test and disconnect DC motor after it is fully retracted. o Key off, wait 10 seconds. o Remove air cleaner from throttle body. o Inspect throttle for freedom of movement and proper closure. o **Does throttle move freely and close without obstruction?**	Yes ▶ No ▶	RECONNECT DC motor. GO to **KB13**. SERVICE as necessary. RERUN Quick Test.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test KB

TEST STEP	RESULT ▶	ACTION TO TAKE
KB13 CHECK VOLTAGE OF VREF TO SIGNAL RETURN		
• Key off, wait 10 seconds. • Disconnect TP vehicle harness connector at the throttle body. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. • DVOM on 20 volt scale. • Key on engine off. • Measure voltage between VREF and SIG RTN at the TP vehicle harness connector. • **Is the voltage between 4 and 6 volts?**	Yes ▶ No ▶	RECONNECT TP sensor. GO to KB14. GO to Pinpoint Test Step C1.
KB14 CHECK THROTTLE STOP RPM		
• Run Key On Engine Off Self-Test and disconnect the DC motor after it has fully retracted and exit Self Test. • Start engine and verify that the throttle stop rpm is less than curb idle rpm. • **Is the throttle stop set below the curb idle?**	Yes ▶ No ▶	RECONNECT DC motor. REPLACE the TP sensor. RERUN Quick Test. RECONNECT DC motor. GO to the adjustment procedure in Section 4. ADJUST throttle stop rpm. RERUN Quick Test.
KB15 SERVICE CODE 53: GENERATE SERVICE CODE 63		
Service Code 53 indicates the throttle position sensor output signal is higher than the Self-Test maximum of 4.7 volts. Possible causes: — Faulty throttle position sensor — Faulty processor — Short to power in throttle position sensor circuit • Key off, wait 10 seconds. • Disconnect harness from the TP sensor at the throttle body. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. • Run Key On Engine Off Self-Test and record codes. • **Is Code 63 present?** • Ignore all other codes.	Yes ▶ No ▶	GO to KB16. GO to KB17.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test KB

TEST STEP	RESULT ▶	ACTION TO TAKE
KB16 CHECK VOLTAGE VREF TO SIG RTN		
• Key off, wait 10 seconds. • Harness disconnected from TP sensor at throttle body. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between VREF and SIG RTN at the TP vehicle harness connector. • **Is the voltage between 4 and 6 volts?**	Yes ▶ No ▶	REPLACE the TP sensor. RERUN Quick Test. GO to Pinpoint Test Step C1 .
KB17 CHECK TP SIGNAL FOR SHORT TO POWER		
• Key off, wait 10 seconds. • Harness disconnected from TP sensor. • DVOM on 200,000 ohm scale. • Disconnect the processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Measure resistance between Test Pin 47 and Test Pins 26 and 57 at the breakout box. • **Are both resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT all components. REPLACE processor. RERUN Quick Test. REMOVE breakout box. RECONNECT all components. SERVICE short circuit(s). RERUN Quick Test.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test KB

TEST STEP	RESULT ▶	ACTION TO TAKE
KB18 SERVICE CODE 63: GENERATE SERVICE CODE 53		
Service Code 63 indicates the throttle position sensor output signal is less than the Self-Test minimum of 0.2 volts. Failure mode indicates closed throttle to the processor. Possible causes: — Faulty throttle position sensor — Open in throttle position sensor harness circuit — Short to ground in throttle position sensor harness circuit — Faulty processor • Key off, wait 10 seconds. • Disconnect harness from the TP sensor at the throttle body. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. • Jumper VREF to TP signal at the TP vehicle harness connector. • Run Key On Engine Off Self-Test. **NOTE: If no codes are generated, immediately remove jumper and go directly to KB21.** • **Is Code 53 present?** • Ignore all other codes at this time.	Yes ▶ No ▶	REPLACE TP sensor. RERUN Quick Test. GO to KB19.
KB19 CHECK VOLTAGE VREF TO SIG RTN		
• Key off, wait 10 seconds. • Harness disconnected from TP sensor at throttle body. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between VREF and SIG RTN at the TP vehicle harness connector. • **Is the voltage between 4 and 6 volts?**	Yes ▶ No ▶	GO to KB20. GO to Pinpoint Test Step C1.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test KB

TEST STEP	RESULT ▶	ACTION TO TAKE
KB20 CHECK CONTINUITY OF TP CIRCUIT		
o Key off, wait 10 seconds. o Harness disconnected from TP sensor at throttle body. o DVOM on 200 ohm scale. o Disconnect the processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o Install breakout box, leave processor disconnected. o Measure resistance between TP signal at the TP vehicle harness connector and Test Pin 47 at the breakout box. o **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to KB21. REMOVE breakout box. SERVICE open circuit. RECONNECT harness to TP sensor. RERUN Quick Test.
KB21 CHECK TP SIGNAL FOR SHORT TO GROUND		
o Key off, wait 10 seconds. o Harness disconnected from TP sensor at throttle body. o Breakout box installed. o Processor disconnected. o DVOM on 200,000 ohm scale. o Measure resistance between TP signal at TP vehicle harness connector and Test Pins 40, 46 and 60 at the breakout box. o **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REMOVE breakout box. REPLACE processor. RECONNECT TP sensor. RERUN Quick Test. REMOVE breakout box. RECONNECT all components. SERVICE short circuit(s). RERUN Quick Test.
KB22 SERVICE CODE 73: VERIFY THROTTLE OBSTRUCTION CODE		
Service Code 73 indicates the processor did not detect a sufficient change in throttle position during the "goose" test portion of the Self-Test. Possible causes: — Faulty throttle position sensor or sensor circuit — Faulty EGR system — Faulty EGO sensor or sensor circuit — Faulty idle tracking switch circuitry o Rerun Key On Engine Off Self-Test. o **Is Code 73 still present?**	Yes ▶ No ▶	REPLACE TP sensor. RERUN Quick Test. SERVICE other codes.

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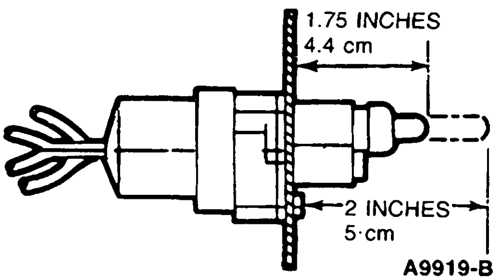
DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test **KB**

TEST STEP	RESULT ▶	ACTION TO TAKE
KB23 SERVICE CODE 12: CHECK FOR CODES THAT COULD CAUSE CODE 12		
Service Code 12 indicates the system is not capable of raising engine speed above curb idle. • **Are Service Codes 31, 32, 34, 35, 41, or 58 present in Engine Running Self-Test?**	Yes ▶ No ▶	SERVICE these codes first. GO to Quick Test Step 5.0C for direction. GO to KB24 .
KB24 CHECK FOR STICKING THROTTLE LINKAGE		
• Check the throttle plates and/or linkage for sticking or binding. • Check speed control linkage for proper adjustment. • **Does throttle open and close properly?**	Yes ▶ No ▶	GO to KB25 . SERVICE as necessary. RERUN Quick Test.
KB25 CHECK DC MOTOR FOR PROPER OPERATION		
• Key off, wait 10 seconds. • Disconnect harness from DC motor. CAUTION **Do not short to other pins when connecting jumper wire.** • Jumper ISC+ circuit of DC motor to battery positive and ISC– circuit of DC motor to battery ground for 4 seconds. • Jumper ISC+ circuit of DC motor to battery ground and ISC– circuit of DC motor to battery positive for 4 seconds. • **Does the DC motor shaft extend greater than 2 inches (5 cm) and retract less than 1.75 inches (4.4 cm) from mounting bracket (see below)?**  A9919-B	Yes ▶ No ▶	RECONNECT DC motor. REPLACE processor. RERUN Quick Test. REPLACE DC MOTOR. RERUN Quick Test.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test **KB**

TEST STEP	RESULT ▶	ACTION TO TAKE
KB26 SERVICE CODE 13 OR 19: CHECK FOR ERRATIC IDLE		
Service Codes 13 or 19 indicate that the engine does not remain at a specified lower rpm prior to entering the "goose" test portion of the Self-Test. Possible causes: — Faulty MAP/BP sensor or sensor circuit — Faulty EGR sensor or sensor circuit — Faulty EGO sensor or sensor circuit — Faulty idle tracking switch circuit o Engine should be at normal operating temperature. o Deactivate Self-Test. o A/C off. o Run engine for 3 minutes alternating between 30 second idles and 5 second part throttle modes. o **Is the idle erratic at the end of the 3 minute idle/part throttle test?**	Yes ▶ No ▶	GO to KB27. GO to KB28.
KB27 CHECK FOR ADDITIONAL SERVICE CODES IN ENGINE RUNNING SELF-TEST		
o With engine at idle, check for vacuum leaks. Service as necessary. **WARNING** **EXTREME CAUTION MUST BE TAKEN WHEN MAKING INSPECTIONS WITH ENGINE RUNNING.** o Rerun Engine Running Self-Test. o **Are service codes 22, 31, 32, 34, 35, 41 or 58 present?**	Yes ▶ No ▶	GO to Quick Test Step 5.0C for direction. GO to KB28.
KB28 CHECK FOR PROPER OPERATION OF THROTTLE		
o Inspect the throttle plates and/or linkage for proper function. o **Does the throttle open and close properly?**	Yes ▶ No ▶	REPLACE DC motor. RERUN Quick Test. SERVICE as necessary. RERUN Quick Test.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test **KB**

TEST STEP	RESULT ▶	ACTION TO TAKE
KB29 SERVICE CODE 99: CHECK PROCESSOR FUNCTION		
Service Code 99 indicates the EEC system has not learned to control the engine idle speed. Possible cause: — Faulty processor • With Self-Test deactivated, start the engine. DO NOT touch the throttle. • Let the engine idle for 2 minutes. • Key off, wait 10 seconds. • Run Key On Engine Off Self-Test until the service codes begin to be displayed, then deactivate Self-Test. • Key off, wait 10 seconds. • Rerun Engine Running Self-Test. • **Is Service Code 99 present?**	Yes ▶ No ▶	REPLACE processor. RERUN Quick Test. SERVICE other codes as necessary.
KB30 SERVICE CODE 16 OR 17: CHECK FOR RELATED MECHANICAL PROBLEMS OR MISADJUSTMENTS		
Service Code 16 could indicate that the accelerator pedal was touched during the Engine Running Self-Test. If Service Code 17 was present, check for electrical loads on the engine, (e.g. A/C or cooling fan on during Self-Test). • Check for vacuum leaks. • Check for throttle plate and/or linkage sticking or binding. • Check for speed control linkage for proper adjustment. • Verify proper base engine timing. • Verify proper throttle stop screw adjustment according to Section 4 of this manual. • **Are all of the above areas okay?**	Yes ▶ No ▶	SERVICE other EEC-IV codes as necessary. SERVICE as necessary. RERUN Quick Test.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test KB

KB90 CONTINUOUS MEMORY CODE 13:

A Continuous Memory Code 13 indicates that sometime in the last 40 warm-up cycles the TP sensor rotation did not follow the reaction of the DC motor when idle speed control was in a dashpot mode. This condition may be caused by:

- The DC motor sticking at part throttle.
- An open in the ITS circuit which, when coupled with other inputs to the processor, causes the EEC-IV system to falsely enter 'dashpot mode'.
- The TP sensor sticking at part throttle.

Each of these areas may generate Key On Engine Off (KOEO) or other Continuous Memory Codes. Therefore, if service has been made for KOEO code 13 or 58, the Continuous Memory Code 13 can be considered serviced and erased from memory. If a Continuous Memory Code 38 is present along with the Continuous Memory Code 13, service the 38 first.

If these other codes were not present make the following checks:

- Refer to **KB1** and check for FULL travel of the DC motor shaft. Replace the DC motor if full travel is not possible. Leave the motor fully retracted.
- With the DC motor fully retracted and the ITS not touching the throttle lever (ITS closed circuit) check for an intermittent open in the ITS circuit. Turn the ignition key off and install the breakout box. Make the necessary connector/pin inspections. With the DVOM on the 200 ohm scale, monitor between Test Pins 28 (Test Pin 24 on 2.5L CFI) and 46 while tapping, wiggling, bending, etc. the DC motor connector and harness.

  NOTE: Do not push in the idle tracking switch — While performing this wiggle test

  The DVOM will change from less than 5 ohms to greater than 5 ohms if an open circuit is created. Service as necessary.
- Check for a sticking TP sensor by monitoring TP voltage while moving the throttle from a wide-open position to a closed throttle position. To do this it is necessary to install the breakout box. Make the necessary connector/pin inspections. It is also necessary to fully retract the shaft of the DC motor by placing a jumper between Test Pins 41 and 57. When the motor has fully retracted, disconnect it at the harness and remove the jumper wire from the breakout box. With the ignition key on and the DVOM on the 20 volt scale, slowly move the throttle from wide-open to closed throttle. The voltage should move from more than 4 volts to less than 1.5 volts. If the TP sensor hangs up in midrange replace it; otherwise no service should be made.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test **KB**

KB91 CONTINUOUS MEMORY CODE 38:

A Continuous Memory Code 38 indicates that in the last 40 warm-up cycles the Idle Tracking Switch was open (ITS touching the throttle) when the throttle angle was greater than the MAX extension of the DC motor shaft. This could be caused by:

- An open (either intermittent or hard fault) in the ITS circuit.
- Idle Tracking Switch stuck open (pushed in position).

Either of these conditions may cause a code 58 to appear in Key On Engine Off (KOEO). If service has been made for a KOEO code 58, the Continuous Memory Code 38 can be considered serviced and erased from memory.

If KOEO code 58 was not present the following checks can be made:

- With the DC motor fully retracted and the ITS not touching the throttle lever (ITS closed circuit) check for an intermittent open in the ITS circuit. Turn the ignition key off and install the breakout box. Make the necessary connector/pin inspections. With the DVOM on the 200 ohm scale, monitor between Test Pins 28 (Test Pin 24 on 2.5L CFI) and 46 while tapping, wiggling, bending, etc. the DC motor connector and harness.

  DO NOT PUSH IN THE IDLE TRACKING SWITCH.

  The DVOM will change from less than 5 ohms to greater than 5 ohms if an open circuit is created. Service as necessary. If an open circuit cannot be created, no service should be made.

KB92 CONTINUOUS MEMORY CODE 71:

A Continuous Memory Code 71 indicates that sometime in the last 40 warm-up cycles the Idle Tracking Switch was closed (ITS not touching the throttle lever) when the DC motor was in "preposition" — [after the engine has been running and the ignition key is turned off the DC motor fully retracts and then extends to a predetermined position for the next start-up]. This can be caused by:

- The ITS circuit shorted to GROUND or SIGNAL RETURN (intermittent or hard fault).
- ITS stuck closed (ITS **NOT** in the pushed in position).

Either of these conditions may cause a Key On Engine Off (KOEO) code 68. If service has been made for KOEO code 68, the Continuous Memory Code 71 can be considered serviced and erased from memory.

If KOEO 68 was not present make the following checks:

- Check the ITS circuit for an intermittent short to ground or Signal Return. Turn the ignition key off. Enter the KOEO Continuous Monitor Mode per Quick Test Appendix. Systematically tap, wiggle, or bend the harness while looking for an indication of a fault. If a fault is created, service as necessary; otherwise no service should be made.

NOTE: Due to the nature of this Test Step, Code 71 will not reappear in memory if a fault is found.

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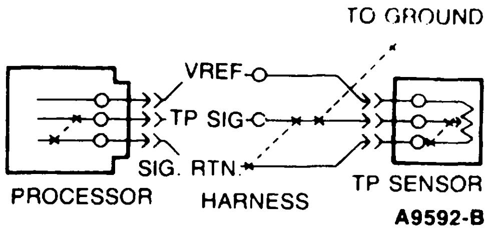
DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test KB

TEST STEP	RESULT ▶	ACTION TO TAKE
KB93 CONTINUOUS MEMORY CODE 53: EXERCISE TP SENSOR		
Continuous Memory Service Code 53 indicates the throttle position sensor output signal was higher than the Self-Test maximum of 4.7 volts. Failure mode indicates WOT to processor. Possible causes: — Faulty throttle position sensor — Faulty processor — Short to power in throttle position sensor circuit ○ Enter Key On Engine Off. ○ Using Continuous Monitor Mode. Refer to Quick Test Appendix. ○ Observe VOM or STAR LED for indication of a fault while performing the following: ○ Move throttle slowly to WOT position. ○ Release throttle slowly to closed position and lightly tap on TP sensor (simulate road shock). ○ Wiggle TP harness connector. ○ **Is a fault indicated?**	Yes ▶ No ▶	GO to KB94 . GO to KB95 .



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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test **KB**

TEST STEP	RESULT ▶	ACTION TO TAKE
KB94 MEASURE THROTTLE POSITION SIGNAL VOLTAGE WHILE EXERCISING TP SENSOR		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • DVOM on 20 volt scale. • Connect a DVOM from Test Pin 47 to Test Pin 46. • Key on, engine off. • While observing DVOM, perform the following: — Move throttle slowly to closed position and lightly tap on TP sensor (simulating road shock). — Wiggle TP harness and connector. • **Does the fault occur below 4.25 volts?**	Yes ▶	DISCONNECT and INSPECT connectors. If connector and terminals are good, REPLACE TP sensor. CLEAR Continuous Memory. REFER to Quick Test Appendix. REFER to Shop Manual, Group 24 and RERUN Quick Test.
	No ▶	Throttle position sensor overtravel may have caused the Continuous Memory Code 53. Sensor service is not required. To verify harness integrity, GO to KB95.
KB95 CHECK EEC-IV HARNESS		
• Enter Key On Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: Referring to the illustration in Step DH90, grasp the harness close to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV harness from the dash panel to the processor. • **Is a fault indicated?**	Yes ▶	ISOLATE fault and make necessary repairs. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test
	No ▶	GO to KB96.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test KB

TEST STEP	RESULT	ACTION TO TAKE
KB96 CHECK PROCESSOR AND HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. • Inspect both connectors and connector terminals for obvious damage or faults. • **Are connectors and terminals OK?**	Yes ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.
	No ▶	SERVICE as necessary. CLEAR Continuous Memory. REFER to Quick Test Appendix. REPEAT Quick Test.
KB97 CONTINUOUS MEMORY CODES 23 or 63: EXERCISE TP SENSOR		
Continuous Memory Service Codes 23 or 63 indicate the throttle position sensor output signal is less than the self-test minimum of 0.2 volts. Failure mode indicates closed throttle to the processor. Possible causes: — Faulty throttle position sensor — Open in throttle position sensor harness circuit — Short to ground in throttle position sensor harness circuit — Faulty processor • Using Key On Engine Off Continuous Monitor mode, observe VOM or STAR LED for indication of a fault while performing the following: • Move throttle slowly to WOT position. • Release throttle slowly to closed condition. • Lightly tap on TP sensor (simulate road shock). • Wiggle TP harness connector. • **Is a fault indicated?**	Yes ▶	DISCONNECT and INSPECT connectors. If connector and terminals are good, REPLACE TP sensor. CLEAR Continuous Memory. REFER to Shop Manual, Group 24 and RERUN Quick Test.
	No ▶	GO to **KB98**.

* Can be purchased as a separate item.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test KB

TEST STEP	RESULT ▶	ACTION TO TAKE
KB98 CHECK EEC-IV HARNESS		
• Enter Key On Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: Referring to the illustration in Step DH94, grasp the harness close to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV harness from the dash panel to the processor. • **Is a fault indicated?**	Yes ▶ No ▶	ISOLATE fault and make necessary repairs. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test. GO to KB99.
KB99 CHECK PROCESSOR AND HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. • Inspect both connectors and connector terminals for obvious damage or faults. • **Are connectors and terminals OK?**	Yes ▶ No ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix. SERVICE as necessary. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.

* Can be purchased as a separate item.

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Air Management System (AM1/AM2)

Pinpoint Test KC

Note

You should enter this Pinpoint Test only when a Service Code 44, 45, 46, 81, 82 or 94 is received in Quick Test Step 3.0 or 5.0.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Thermactor System
  - Belt
  - Pump
  - Valve

This Pinpoint Test is intended to diagnose only the following:

- AM1 and AM2 Solenoid Valve Assemblies (-9H465-)
- Harness Circuits: AM1/AM2 and VPWR
- Vacuum Supply
- Processor Assembly (-12A650-)

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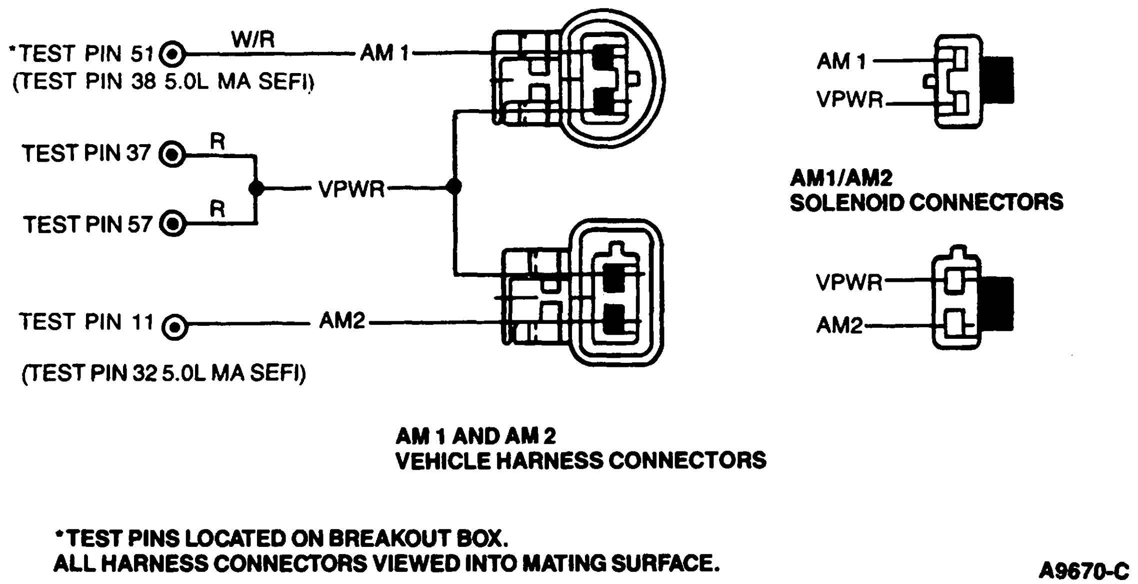
Air Management System (AM1/AM2)

Pinpoint Test **KC**

Pinpoint Test Schematic



Test Pin 11 or 32	AM2
Application	**Wire Color**
Car: 5.0L SEFI 5.0L SEFI MA	LG/BK
Truck: 4.9L, 5.0L, 5.8L, 7.5L	W/BK

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Air Management System (AM1/AM2) — Pinpoint Test KC

TEST STEP	RESULT ▶	ACTION TO TAKE
KC1 SERVICE CODES 44 (94), 45 AND 46: VERIFY VACUUM LINE ROUTING		
Service Code 44 (94) indicates that thermactor air system is inoperative. Service Code 45 indicates that thermactor air is flowing upstream when not requested. Service Code 46 indicates that thermactor is not being bypassed when requested. Possible causes: — Vacuum hoses leaking, blocked, or kinked — Diverter value, thermactor pump inoperative — Air Management Solenoid(s) defective, blocked o Verify proper vacuum line routing to the AM1/AM2 solenoids and to the bypass diverter valve. Refer to VECI decal. o Check for kinked or blocked vacuum lines. o Check for kinked or blocked air hoses. o Check for disconnected or cracked vacuum lines. o **Are visual checks satisfactory?**	No ▶ Yes ▶	SERVICE routing or faults. RERUN Quick Test. Service Code 44 (94), GO to KC4. Service Code 45, GO to KC2. Service Code 46, GO to KC3.
KC2 ATTEMPT TO ELIMINATE SERVICE CODE 45 (AM2 ONLY)		
o Disconnect vacuum line on diverter valve and cap vacuum line. o Key off, wait 10 seconds. o Repeat Engine Running Self-Test and record service codes. o **Is Code 45 present?**	Yes ▶ No ▶	EEC-IV system OK. REFER to Section 3 for diverter valve or check valve diagnostics. GO to KC4.
KC3 ATTEMPT TO ELIMINATE SERVICE CODE 46 (AM1 ONLY)		
o Disconnect vacuum line on bypass valve and cap vacuum line. o Key off, wait 10 seconds. o Repeat Engine Running Self-Test and record codes. o **Is Code 46 present?**	Yes ▶ No ▶	EEC-IV system OK. REFER to Section 3 for bypass valve diagnostics. GO to KC4.

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Air Management System (AM1/AM2) — Pinpoint Test KC

TEST STEP		RESULT ▶	ACTION TO TAKE
KC4	ENTER OUTPUT STATE CHECK (REFER TO QUICK TEST APPENDIX)		
	NOTE: Do not use STAR tester for this Step, use a VOM/DVOM. • Key off, wait 10 seconds. • DVOM on 20 volt scale. • Connect DVOM negative test lead to STO circuit at the Self-Test connector and positive test lead to battery positive. • Jumper STI circuit to SIGNAL RETURN at the Self-Test connector. • Perform Key On, Engine Off Self-Test until the completion of the Continuous Memory Test Codes. • DVOM will indicate zero volts when Test is complete. • Depress and release the throttle. • **Did DVOM change to a high voltage?**	Yes ▶ No ▶	REMAIN in Output State Check. GO to KC5. DEPRESS throttle to WOT and RELEASE. If STO voltage does not go high, GO to Pinpoint Test Step QC1. Leave equipment hooked up.
KC5	CHECK AM1/AM2 SOLENOID ELECTRICAL OPERATION		
	• DVOM on 20 volt scale. • Disconnect AM1 and AM2 solenoids. • Connect DVOM positive test lead to VPWR circuit and negative test lead to AM1 circuit on AM1 solenoid vehicle harness connector. • While observing DVOM depress and release the throttle several times (to cycle output On and Off). • Repeat for AM2 solenoid. Connect positive test lead to VPWR circuit and negative test lead to AM2 circuit on AM2 solenoid vehicle harness connector. • **Do both solenoids cycle On and Off?**	Yes ▶ No ▶	GO to KC6. REMOVE jumper. GO to KC9.

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Air Management System (AM1/AM2) | Pinpoint Test | KC

TEST STEP		RESULT ▶	ACTION TO TAKE
KC6	CHECK AM1/AM2 SOLENOID FOR VACUUM CYCLING		
	∘ Install vacuum pump to the AM1 solenoid vacuum supply port and install a vacuum gauge to the output port. ∘ While cycling outputs On and Off (by depressing and releasing throttle), observe the vacuum gauge at the output. **NOTE: Maintain vacuum at source.** ∘ Repeat for AM2 solenoid. Connect vacuum pump to the AM2 solenoid vacuum supply port and connect a vacuum gauge to the output port. ∘ Cycle output On and Off. ∘ **Do both vacuum outputs cycle On and Off?**	Yes ▶ No ▶	GO to KC7. REPLACE solenoid assembly. RERUN Quick Test.
KC7	CHECK MANIFOLD VACUUM LINES FOR BLOCKAGE OR LEAKS		
	∘ Vacuum lines disconnected at AM1/AM2 solenoids. ∘ Start engine. ∘ Check for vacuum. ∘ **Is vacuum present at the solenoids?**	Yes ▶ No ▶	EEC-IV system OK. REFER to Section 3 for Thermactor valve and air pump diagnostics. SERVICE vacuum source blockage or leak. RERUN Quick Test.
KC8	SERVICE CODE 81 AND 82: CHECK VOLTAGE OF VPWR CIRCUIT		
	Service Code 81, 82 indicates that voltage output for thermactor air solenoid(s) did not change when activated. Possible causes: — AM1/AM2 circuits shorted to power — AM1/AM2 circuits open or grounded — AM1/AM2 solenoid resistance out of range — Faulty processor ∘ Key on, engine off. ∘ DVOM on 20 volt scale. ∘ Measure voltage between AM1 solenoid VPWR circuit and battery ground. ∘ Repeat for AM2 solenoid. ∘ **Are both voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to KC9. RECONNECT AM1/AM2 solenoids. SERVICE harness circuit open. RERUN Quick Test.

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Air Management System (AM1/AM2) — Pinpoint Test KC

TEST STEP	RESULT ▶	ACTION TO TAKE
KC9 MEASURE AM1/AM2 SOLENOID RESISTANCE		
• Key off, wait 10 seconds. • DVOM on 200 ohm scale. • Disconnect AM1 solenoid connector and measure solenoid resistance. • Disconnect AM2 solenoid connector and measure solenoid resistance. • **Are both resistances between 50 and 100 ohms?**	Yes ▶ No ▶	GO to KC10 . REPLACE AM1/AM2 solenoid assembly. RERUN Quick Test.
KC10 CHECK CONTINUITY OF AM1 AND AM2 CIRCUITS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 51 (Test Pin 38 for 5.0L MA SEFI) at breakout box and AM1 circuit at vehicle harness connector. • Measure resistance between Test Pin 11 (Test Pin 32 for 5.0L MA SEFI) at the breakout box and AM2 circuit at vehicle harness connector. • **Are both resistances less than 5.0 ohms?**	Yes ▶ No ▶	GO to KC11 . REMOVE breakout box. RECONNECT processor and AM1/AM2 solenoids. SERVICE harness open circuit. RERUN Quick Test.

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Air Management System (AM1/AM2)

Pinpoint Test **KC**

TEST STEP	RESULT	ACTION TO TAKE
KC11 CHECK FOR SHORT TO GROUND		
• Key off, wait 10 seconds. • DVOM on 200,000 ohm. • Breakout box installed, processor disconnected. • Disconnect AM1/AM2 solenoids. • Measure resistance between Test Pin 51 (Test Pin 38 for 5.0L MA SEFI) and Test Pins 40, 46 and 60 and between Test Pin 11 (Test Pin 32 for 5.0L MA SEFI) and Test Pins 40, 46 and 60 at the breakout box. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to KC12. SERVICE short to ground. REMOVE breakout box. RECONNECT processor and AM1/AM2 solenoids. RERUN Quick Test.
KC12 CHECK FOR SHORT TO POWER		
• Key off, wait 10 seconds. • DVOM on 200,000 ohm scale. • Breakout box installed, processor disconnected. • AM1/AM2 solenoids disconnected. • Measure resistance between Test Pin 51 (Test Pin 38 for 5.0L MA SEFI) and Test Pins 37 and 57, and between Test Pin 11 (Test Pin 32 for 5.0L MA SEFI) and Test Pins 37 and 57 at the breakout box. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT AM1/AM2 solenoid. REPLACE processor. RERUN Quick Test. REMOVE breakout box. RECONNECT processor and AM1/AM2 solenoids. SERVICE short to power. RERUN Quick Test. If code is present, REPLACE processor.

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Canister Purge (CANP)

Pinpoint Test **KD**

Note

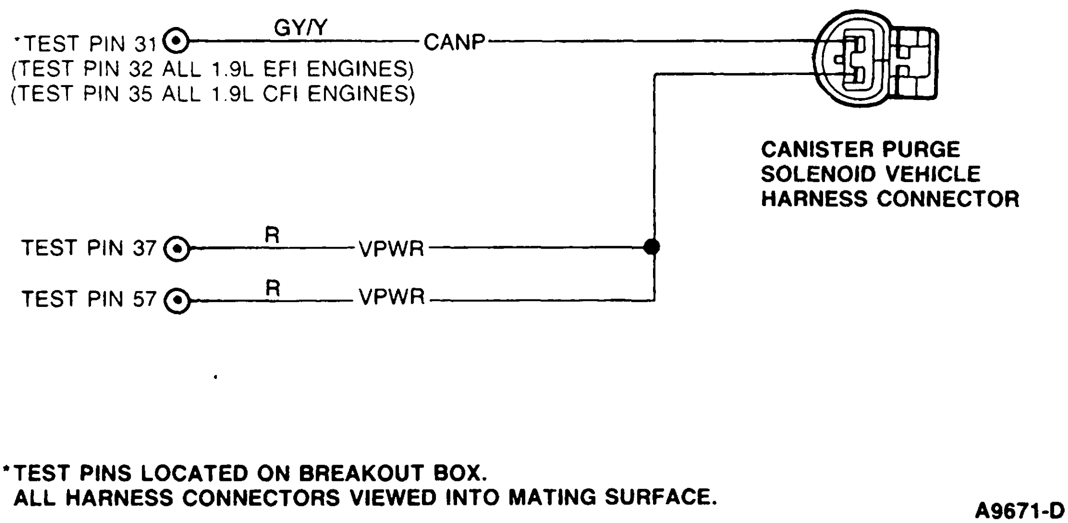
You should enter this Pinpoint Test only when a Service Code 85 is received in Quick Test Step 3.0 or 7.0.

Remember

This Pinpoint Test is intended to diagnose only the following:

- CANP solenoid (-9C915-)
- Harness circuits: CANP and VPWR
- Processor assembly (-12A650-)

Pinpoint Test Schematic



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Canister Purge (CANP)

Pinpoint Test **KD**

TEST STEP	RESULT ▶	ACTION TO TAKE
KD1 ENTER OUTPUT STATE CHECK (REFER TO QUICK TEST APPENDIX)		
NOTE: Do not use STAR tester for this step, use VOM/DVOM. o Key off, wait 10 seconds. o DVOM on 20 volt scale. o Connect DVOM negative test lead to STO circuit at Self-Test connector and positive test lead to battery positive. o Jumper STI circuit to SIGNAL RETURN at the Self-Test connector. o Perform Key On Engine Off Self-Test until the completion of the Continuous Test Codes. o DVOM will indicate less than 1.0 volt when test is completed. o Depress and release the throttle. o **Does voltage increase?**	Yes ▶ No ▶	REMAIN in Output State Check. GO to KD2 . DEPRESS throttle to WOT and release. If STO voltage does not go high, GO to Pinpoint Test Step QC1 Leave equipment hooked up.
KD2 CHECK CANISTER PURGE (CANP) SOLENOID ELECTRICAL OPERATION		
o Key on, engine off. o Disconnect CANP solenoid. o Connect DVOM positive test lead to VPWR circuit and negative test lead to CANP output circuit on the vehicle harness connector. o DVOM on 20 volt scale. o While observing DVOM depress and release the throttle several times to cycle output. o **Does CANP circuit cycle?**	Yes ▶ No ▶	GO to KD3 . REMOVE jumper. GO to KD6 .
KD3 CHECK CANISTER PURGE SOLENOID FOR VACUUM LEAKS		
o Key on. o CANP solenoid disconnected. o Disconnect vacuum hose at canister purge solenoid on manifold vacuum side of engine. o Apply 16 in-Hg (53 kPa) of vacuum to manifold vacuum side of CANP solenoid. o **Does CANP solenoid hold vacuum for 20 seconds?**	Yes ▶ No ▶	REMAIN in output state check. Leave vacuum pump setup in place. GO to KD4 . REPLACE CANP solenoid. RERUN Quick Test. If symptom is still present, GO to Section 3, Carbon Canister.

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Canister Purge (CANP) — Pinpoint Test KD

TEST STEP	RESULT ▶	ACTION TO TAKE
KD4 CHECK CANISTER PURGE SOLENOID FOR MECHANICAL OPERATION		
• While remaining in output state check, reconnect CANP solenoid connector. • Apply 16 in-Hg (53 kPa) of vacuum to manifold vacuum side of CANP solenoid. • Depress and release throttle. • **Is vacuum released?**	Yes ▶	CHECK hose from solenoid to canister for cracks, leaks, etc. If OK, REMOVE Jumper from STI to SIGNAL RETURN. GO to **KD5**.
	No ▶	CHECK hose from solenoid to canister for blockage or kinks. If OK, REPLACE CANP solenoid. RERUN Quick Test.
KD5 CHECK FOR VACUUM TO CANISTER PURGE SOLENOID		
• Disconnect vacuum hose at canister purge solenoid at manifold vacuum side. • Start engine. • **Is vacuum present at engine vacuum hose?**	Yes ▶	EEC-IV system OK. If a symptom is still present, GO to Section 7, Evaporative Emission Systems Diagnosis.
	No ▶	CHECK vacuum line for proper routing, kinks or blockage. If OK, REFER to Shop Manual, Group 21 (Group 3 for Compact Truck) for probable subjects affecting engine vacuum.

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Canister Purge (CANP) — Pinpoint Test KD

TEST STEP	RESULT ▶	ACTION TO TAKE
KD6 MEASURE CANP SOLENOID RESISTANCE		
Service Code 85 indicates a failure in the Canister Purge solenoid (CANP) circuit. Possible causes are: — Faulty CANP solenoid — Open harness — Shorted (Power or Ground) harness — Faulty processor. ∘ Key off, wait 10 seconds. ∘ DVOM on 200 ohm scale. ∘ Disconnect CANP solenoid. ∘ Measure solenoid resistance. ∘ **Is resistance between 40 and 90 ohms?**	Yes ▶ No ▶	GO to KD7. REPLACE CANP solenoid. RERUN Quick Test.
KD7 CHECK VOLTAGE OF VPWR CIRCUIT		
∘ Key on, engine off. ∘ CANP solenoid disconnected. ∘ DVOM on 20 volt scale. ∘ Measure voltage between VPWR at the CANP solenoid vehicle harness connector and battery ground. ∘ **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to KD8. RECONNECT CANP solenoid. SERVICE harness open circuit. RERUN Quick Test.
KD8 CHECK CONTINUITY OF CANP CIRCUIT		
∘ Key off, wait 10 seconds. ∘ CANP solenoid disconnected. ∘ Disconnect processor 60 pin connectors. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. ∘ Install breakout box, leave processor disconnected. ∘ DVOM on 200 ohm scale. ∘ Measure resistance between Test Pin 31 (Test Pin 35 for 1.9L CFI engines, Test Pin 32 for 1.9L EFI engines) at the breakout box and CANP on the vehicle harness connector. ∘ **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to KD9. REMOVE breakout box. RECONNECT processor and CANP solenoid. SERVICE open circuit. RERUN Quick Test.

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Canister Purge (CANP) — Pinpoint Test KD

TEST STEP	RESULT ▶	ACTION TO TAKE
KD9 CHECK FOR SHORT TO GROUND		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • CANP solenoid disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 31 (Test Pin 35 for 1.9L CFI engines, Test Pin 32 for 1.9L EFI engines) and Test Pins 40, 46 and 60 at the breakout box. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to KD10. REMOVE breakout box. RECONNECT processor and CANP solenoid. SERVICE short to ground. RERUN Quick Test.
KD10 CHECK FOR SHORT TO POWER		
• Key off, wait 10 seconds. • CANP solenoid disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 31 (Test Pin 35 for 1.9L CFI engines, Test Pin 32 for 1.9L EFI engines) and Test Pins 37 and 57 at the breakout box. • **Are both resistances greater than 10,000 ohms?**	Yes ▶ No ▶	RECONNECT CANP solenoid. REMOVE breakout box. REPLACE processor. RERUN Quick Test. REMOVE breakout box. RECONNECT processor and CANP solenoid. SERVICE short to power. REPEAT Quick Test. If code is repeated, REPLACE processor. RERUN Quick Test.
KD15 CHECK IF CANP WAS CAUSE OF SERVICE CODE 16 OR 26		
• Key off. • Disconnect vacuum hose at canister purge solenoid on canister side. • Start engine and let idle. • **Is vacuum present on canister side of canister purge solenoid?**	Yes ▶ No ▶	GO to KD1. WITH CODE 26: CHECK for causes of an incorrect engine speed or a vacuum leak. WITH CODE 16: CHECK for vacuum leaks at injector O-rings, vacuum lines/fittings, excessive PCV, or inlet pin leak between air meter and throttle body. SERVICE as necessary. RERUN Quick Test.

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Idle Speed Control (Bypass Air)

Pinpoint Test

KE

Note

You should enter this Pinpoint Test only when a Service Code 12, 13, 16, 17, 19, 47 or 48 is received in Quick Test Step 5.0 or when directed here from Pinpoint Test S.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Engine not up to operating temperature
- Engine over operating temperature
- A/C input (electrical problem)
- Throttle Speed Control Linkage
- Throttle Sticking or Linkage Binding.

This Pinpoint Test is intended to diagnose only the following:

- Rpm in Self-Test only
- ISC Solenoid (-9F715-)
- Harness Circuits ISC and VPWR
- Processor Assembly (-12A650-)

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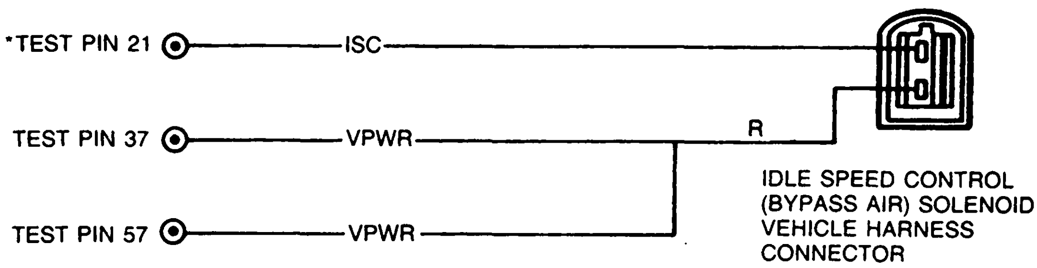
Idle Speed Control (Bypass Air)

Pinpoint Test | **KE**

Pinpoint Test Schematic



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9672-C

TEST PIN 21	ISC
APPLICATION	**COLOR**
1.9L EFI 3.0L EFI CAR/TRK 3.0L SHO 3.8L SEFI AXOD	O/BK
2.3L EFI HSC	BR/W
2.3L EFI OHC 5.0L SEFI 5.0L SEFI MA	W/LB
3.8L SEFI RWD 3.8L SEFI SC	R/LG
2.3L EFI TC 2.3L EFI TRK 2.9L EFI TRK 4.9L EFI TRK 5.0L EFI TRK 5.8L EFI TRK 7.5L EFI TRK	GY/W

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Idle Speed Control (Bypass Air) — Pinpoint Test KE

TEST STEP	RESULT ▶	ACTION TO TAKE
KE1 SERVICE CODE 12: CHECK FOR RPM DROP		
1.9L EFI: Service Code 12 indicates that during Engine Running Self-Test, engine was unable to achieve the Self-Test upper limit. All Others: Service Code 12 indicates that during Engine Running Self-Test, engine rpm could not be controlled within the Self-Test lower limit band. Possible causes are: — Open or shorted circuit — Throttle linkage binding — Improper idle set — Throttle body/ISC solenoid contamination — Items external to Idle Speed Control system that could affect engine rpm. — Faulty ISC solenoid — Faulty processor o Key off. o Connect engine tachometer. o Start engine. o Disconnect ISC harness connector. o **Does rpm drop or stall?**	Yes ▶ No ▶	GO to KE2. GO to KE3.
KE2 CHECK FOR EGR CODES		
o **Are Service Codes 31, 32, 33 or 34 present?**	Yes ▶ No ▶	RECONNECT ISC solenoid. GO to Quick Test Step 5.0 for appropriate Pinpoint Test. GO to KE3.

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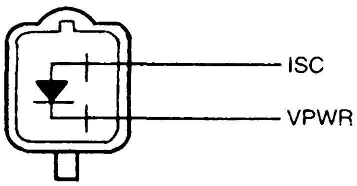
Idle Speed Control (Bypass Air) | Pinpoint Test | KE

TEST STEP	RESULT ▶	ACTION TO TAKE
KE3 CHECK FOR OTHER EEC CODES		
• **Are Service Codes 22, 41, 42, 91 or 92 present?**	Yes ▶	RECONNECT ISC solenoid. For 1.9L EFI with Code 42 present, GO to KE4. All others GO to Quick Test Step 5.0 for appropriate Pinpoint Test.
	No ▶	GO to KE4.
KE4 MEASURE ISC SOLENOID RESISTANCE		
• Key off. • ISC solenoid disconnected. • DVOM on 200 ohm scale. • Measure solenoid resistance. • **Is resistance between 7.0 and 13.0 ohms?** **NOTE: Due to diode in solenoid, place DVOM + lead on VPWR pin and - lead on ISC pin**  **ISC SOLENOID CONNECTOR** **A9225-A**	Yes ▶	GO to KE5.
	No ▶	REPLACE ISC solenoid. RERUN Quick Test.
KE5 CHECK FOR INTERNAL SHORT TO ISC SOLENOID CASE		
• Key off. • ISC solenoid disconnected. • DVOM on 200,00 ohm scale. • Measure resistance from either ISC solenoid pin to ISC housing. • **Is resistance greater than 10,000 ohms?**	Yes ▶	GO to KE6.
	No ▶	REPLACE ISC solenoid. RERUN Quick Test.

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Idle Speed Control (Bypass Air) — Pinpoint Test KE

TEST STEP	RESULT ▶	ACTION TO TAKE
KE6 CHECK VOLTAGE OF VPWR CIRCUIT		
• Key on, engine off. • ISC solenoid disconnected. • DVOM on 20 volt scale. • Measure voltage between VPWR at the ISC solenoid harness connector and battery ground. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to KE7. SERVICE open circuit. RERUN Quick Test.
KE7 CHECK CONTINUITY OF ISC CIRCUIT		
• Key off. • ISC solenoid disconnected. • Disconnect processor and inspect both 60 pin connectors for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 21 at the breakout box and ISC circuit at vehicle harness connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to KE8. SERVICE open circuit. REMOVE breakout box. RECONNECT processor and ISC solenoid. RERUN Quick Test.
KE8 CHECK ISC CIRCUIT FOR SHORT TO GROUND		
• Key off. • Breakout box installed, processor disconnected. • ISC solenoid disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 21 and Test Pins 40, 46 and 60 at the breakout box. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to KE9. SERVICE short circuit. REMOVE breakout box. RECONNECT processor and ISC solenoid. RERUN Quick Test.

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Idle Speed Control (Bypass Air) | Pinpoint Test | KE

TEST STEP	RESULT ▶	ACTION TO TAKE
KE9 CHECK FOR SHORT TO POWER		
• Key off. • Breakout box installed, processor disconnected. • ISC solenoid disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 37 and Test Pin 21 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶	GO to KE10 .
	No ▶	SERVICE short circuit. REMOVE breakout box. RECONNECT processor and ISC solenoid. RERUN Quick Test. If code or symptom is present, REPLACE processor.
KE10 CHECK FOR ISC SIGNAL FROM THE PROCESSOR		
• Key off. • Breakout box installed. • Reconnect processor to breakout box. • Reconnect ISC solenoid. • DVOM on a 20 volt scale. • Connect DVOM between Test Pin 21 and Test Pin 40. • Start engine. • Slowly increase and decrease rpm. • **Does DVOM voltage vary?**	Yes ▶	GO to KE11 .
	No ▶	REMOVE breakout box. REPLACE processor. RERUN Quick Test.
KE11 CHECK BASE IDLE		
• **Is idle speed within specification? (Refer to Section 4)**	Yes ▶	3.8L SEFI's: REPLACE ISC solenoid. RERUN Quick Test. All others: REMOVE ISC solenoid and INSPECT for contamination. CLEAN as necessary. RERUN Quick Test. If code/symptom is present, REPLACE ISC solenoid.
	No ▶	RESET idle to specification. REFER to Section 4 for idle set procedure. RERUN Quick Test. If UNABLE to RESET idle to specification, GO to KE12 .

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Idle Speed Control (Bypass Air) — Pinpoint Test KE

TEST STEP	RESULT	ACTION TO TAKE
KE12 CHECK FOR PROBLEMS AFFECTING PROPER ENGINE SPEED		
o Check throttle linkage and/or speed control linkage for binding. o Inspect throttle body for contamination. o Check engine vacuum hoses. Refer to VECI decal. o **Are all the above checks OK?**	Yes ▶	3.8L SEFI's: REPLACE ISC solenoid. RERUN Quick Test. All others: REMOVE ISC solenoid and INSPECT for contamination. CLEAN as necessary. RERUN Quick Test. If code/symptom is present, REPLACE ISC solenoid.
	No ▶	SERVICE as necessary. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.
KE15 SERVICE CODE 13: VERIFY IDLE SPEED IS WITHIN SPECIFICATION		
1.9L EFI, 2.3L EFI TC: Service Code 13 indicates that during Engine Running Self-Test, engine rpm did not obtain the Self-Test lower limit. All others: Service Code 13 indicates that during Engine Running Self-Test, Engine rpm could not be controlled within the Self-Test Lower limit band. Possible causes are: — Improper idle set — Vacuum leaks — Throttle linkage binding — Throttle plates open — Improper ignition timing (TFI vehicles only) — Throttle body/ISC solenoid contamination — ISC Circuit SHORT to GROUND — Faulty ISC solenoid o **Is idle speed within specification? (Refer to Section 4)**	Yes ▶	3.8L SEFI's: REPLACE ISC solenoid. RERUN Quick Test. All others: REMOVE ISC solenoid and INSPECT for contamination. CLEAN as necessary. RERUN Quick Test. If code/symptom is present, REPLACE ISC solenoid.
	No ▶	RESET idle to specification. REFER to Section 4 for idle set procedure. RERUN Quick Test. If UNABLE to RESET idle to specification, GO to KE6.

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Idle Speed Control (Bypass Air)

Pinpoint Test KE

TEST STEP	RESULT	ACTION TO TAKE
KE16 CHECK FOR CONDITIONS AFFECTING IDLE • Check engine vacuum hoses for leaks. Refer to VECI decal. • Check throttle linkage and/or speed control linkage for binding. • Check that throttle plates are fully closed. • Check for induction system leaks. (ex. ISC solenoid to throttle body gasket.) • Check throttle body for contamination. • Verify base timing is to specification (TFI vehicles only). Refer to VECI decal. • **Are all the above checks OK?**	Yes ▶ No ▶	GO to KE17. SERVICE as necessary. RERUN Quick Test.
KE17 CHECK FOR INTERNAL SHORT TO ISC SOLENOID CASE • Key off. • Disconnect ISC solenoid. • DVOM on 200,000 ohm scale. • Measure resistance from either ISC solenoid pin to ISC housing. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to KE18. REPLACE ISC solenoid. RERUN Quick Test.
KE18 CHECK ISC CIRCUIT FOR SHORT TO GROUND • Key off. • ISC solenoid disconnected. • Disconnect the processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 21 and Test Pins 40, 46 and 60 at the breakout box. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to KE19. SERVICE short circuit. REMOVE breakout box. RECONNECT processor and ISC solenoid. RERUN Quick Test.

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Idle Speed Control (Bypass Air)

Pinpoint Test KE

TEST STEP	RESULT ▶	ACTION TO TAKE
KE19 CHECK PROCESSOR OUTPUT		
o Key off. o Breakout box installed. o Reconnect processor to breakout box. o Reconnect ISC solenoid. o DVOM on 20 volt scale. o Connect DVOM between Test Pin 21 and Test Pin 40. o Start engine. o Slowly increase and decrease rpm. o **Does DVOM voltage vary?**	Yes ▶	3.8L SEFI's: REPLACE ISC solenoid. RERUN Quick Test. All others: REMOVE ISC solenoid and INSPECT for contamination. CLEAN as necessary. RERUN Quick Test. If code/ symptom is present, REPLACE ISC solenoid
	No ▶	REPLACE processor. REMOVE breakout box. RERUN Quick Test.
KE20 SERVICE CODE 47: CHECK FOR LOW FLOW UNMETERED AIR		
Service Code 47 indicates that the measured airflow at base idle was lower than expected. Possible causes are: — Air/vacuum leaks in fuel charging assembly — Purge solenoid/injector O-rings o Check for holes, cracks, and/or disconnections in fuel charging assembly (manifold gaskets, vacuum lines, vacuum tree, etc). o Check for stuck-open purge solenoid and/or injector O-rings. o **Are any faults present?**	Yes ▶	SERVICE as necessary. RERUN Quick Test.
	No ▶	EEC system OK for metered air. GO to Quick Test Step **5.0B** to service other codes if necessary.
KE21 SERVICE CODE 48: CHECK FOR HIGH FLOW UNMETERED AIR		
Service Code 48 indicates that the measured airflow at base idle was higher than expected. Possible causes are: — Air leaks between vane air meter and fuel charging assembly — Loss of ignition/fuel o Check for holes, cracks, and/or disconnections in air cleaner outlet tube (between vane airflow meter and fuel charging assembly). o Check for loss of ignition or fuel on one or more cylinder(s). o **Are any faults present?**	Yes ▶	SERVICE as necessary. RERUN Quick Test.
	No ▶	EEC system OK for metered air. GO to Quick Test Step **5.0B** to SERVICE other codes if necessary.

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Idle Speed Control (Bypass Air)

Pinpoint Test KE

TEST STEP		RESULT ▶	ACTION TO TAKE
KE22	SERVICE CODE 16: HIGH ISC RPM		
Service Code 16 indicates that with the ISC off, engine rpm was above a Self-Test limit. Possible causes are: — Improper idle set — Purge solenoid — Air/vacuum leaks • **Is Code 48 present?**		Yes ▶	RESET throttle plate. REFER to Section 4 and VECI decal for curb idle set procedure. RERUN Quick Test. If Code 48 is still present, GO to KE21.
		No ▶	GO to KD15.
KE25	SERVICE CODE 19: LOW ISC RPM		
Service Code 19 indicates that with the ISC off, engine rpm dropped below a Self-Test limit (usually around 600 rpm). Possible causes are: — Engine not at operating temperature — Throttle body/air inlet contamination — Improper idle set • Key off. • Deactivate Self-Test. • Run engine at 2000 rpm for 2 minutes or until inlet radiator hose is hot and pressurized. • Key off. • Rerun Engine Running Self-Test. • **Does engine stumble and/or is code 19 still present?**		Yes ▶	INSPECT throttle body and air inlet for contamination. SERVICE as necessary. If OK, ADJUST base idle (REFER to Section 4 for procedure). RERUN Quick Test.
		No ▶	SERVICE other codes as necessary.
KE26	SERVICE CODE 17: LOW ISC RPM		
Service Code 17 indicates that with the ISC off, engine rpm was below a Self-Test limit. Possible causes are: — Excessive engine accessory load — Engine not at operating temperature — Throttle body/air inlet contamination — Improper idle set **NOTE: Check and correct excessive engine load problems like cooling fan running, lights on, etc.** • Run engine at 2000 rpm for 2 minutes or until inlet radiator hose is hot and pressurized. • Key off. • Rerun Engine Running Self-Test. • **Is Code 17 still present?**		Yes ▶	INSPECT throttle body and air inlet for contamination. SERVICE as necessary. If OK ADJUST base idle (REFER to Section 4 for procedure). RERUN Quick Test.
		No ▶	SERVICE other codes as necessary.

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Shift Indicator Light (SIL)

Pinpoint Test

KL

Note

You should enter this Pinpoint Test only when directed here from Quick Test Step 7.0, or from Pinpoint Test Step QA9 .

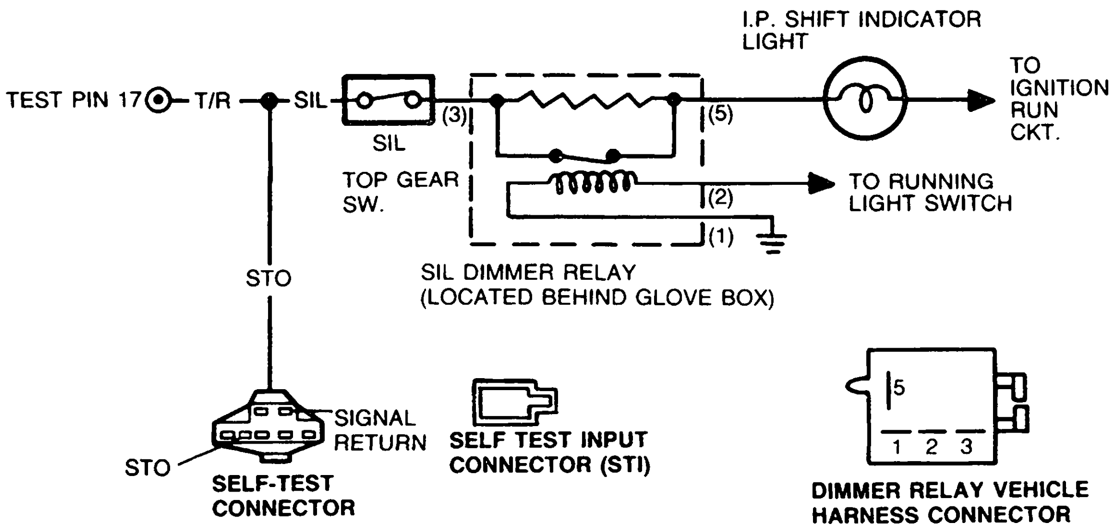
Remember

This Pinpoint Test is intended to diagnose only the following:

- Harness Circuits: SIL and STO
- Top Gear Switch
- SIL Dimmer Relay
- Shift Indicator Light Bulb and Fuse

Pinpoint Test Schematic

1.9L EFI



A9681-D

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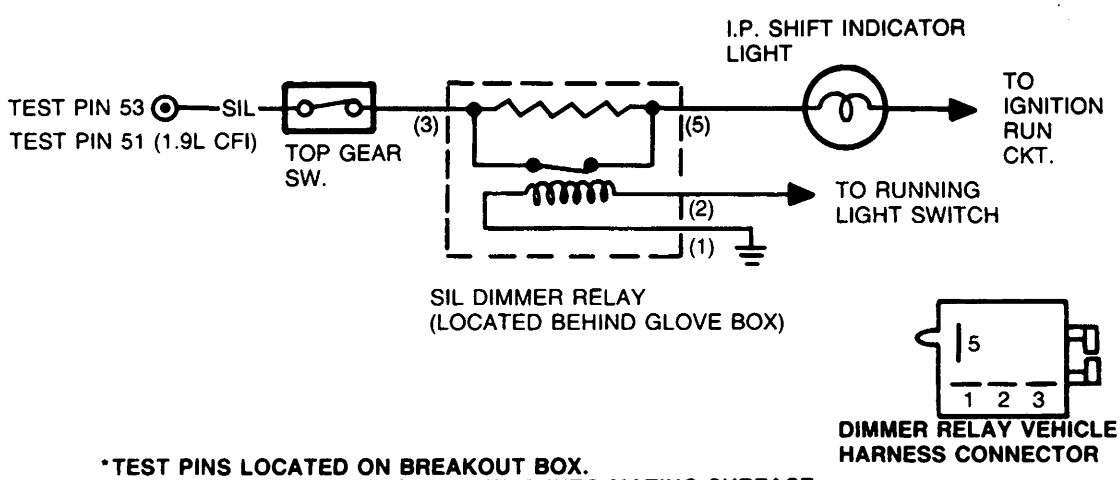
Shift Indicator Light (SIL)

Pinpoint Test

KL

Pinpoint Test Schematic

ALL OTHERS



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9680-D

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Shift Indicator Light (SIL) — Pinpoint Test KL

TEST STEP	RESULT ▶	ACTION TO TAKE
KL1 CHECK SIL OPERATION		
NOTE: To verify SIL operation, inspect the SIL while driving the vehicle. The SIL should turn on when the optimum shift speed is reached in each gear and remain off while in the highest gear.	Yes ▶	GO to KL6 .
If the SIL is always on, look for a short to ground in the SIL circuit. If the SIL is always off, look for an open in the SIL circuit.	No ▶	GO to KL2 .
o **Is SIL on all the time?**		
KL2 CHECK SIL CIRCUIT FUSE		
o Key off, wait 10 seconds.	Yes ▶	RECONNECT fuse. GO to KL3 .
o Remove SIL circuit fuse (#18) and inspect.		
o **Is fuse OK?**	No ▶	SERVICE short to ground between fuse and SIL bulb. REPLACE SIL fuse. VERIFY SIL operation.
KL3 CHECK SIL BULB		
o Key off.	Yes ▶	RECONNECT bulb. GO to KL4 .
o Remove SIL bulb and inspect.		
o **Is bulb OK?**	No ▶	REPLACE SIL bulb. VERIFY SIL operation.
KL4 CHECK SIL DIMMER RELAY CONTINUITY		
o Key off.	Yes ▶	GO to KL5 .
o Disconnect SIL dimmer relay.	No ▶	REPLACE SIL dimmer relay. VERIFY SIL operation.
o DVOM on 200 ohm scale.		
o Measure resistance between Pins 3 and 5 on SIL dimmer relay.		
o **Is resistance less than 5 ohms?**		

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Shift Indicator Light (SIL) — Pinpoint Test KL

TEST STEP	RESULT	ACTION TO TAKE
KL5 CHECK SIL DIMMER RELAY FUNCTION		
• Key off. • SIL dimmer relay disconnected. • Apply 12 volts across Pins 1 and 2 on the SIL dimmer relay. • DVOM on 200 ohm scale. • Measure resistance between Pins 3 and 5 on SIL dimmer relay. • **Is resistance between 40 ohms and 55 ohms?**	Yes ▶ No ▶	GO to KL6 . REPLACE SIL dimmer relay. VERIFY SIL operation.
KL6 CHECK VOLTAGE AT SIL DIMMER RELAY		
• Key on, engine off. • Disconnect SIL dimmer relay. • DVOM on 20 volt scale. • Measure voltage between Test Pin 5 on the SIL dimmer relay vehicle harness connector and the battery negative post. • **Is voltage greater than 5 volts?**	Yes ▶ No ▶	RECONNECT SIL dimmer relay. GO to KL7 . SERVICE circuit between SIL dimmer relay and SIL fuse. VERIFY SIL operation.
KL7 CHECK VOLTAGE AT TOP GEAR SWITCH		
• Key on, engine off. • Disconnect top gear switch. • DVOM on 20 volt scale. • Measure voltage between the SIL dimmer relay side of the top gear switch vehicle harness connector and the battery negative post. • **Is voltage greater than 5 volts?**	Yes ▶ No ▶	GO to KL8 . SERVICE circuit between top gear switch and SIL dimmer relay. VERIFY SIL operation.
KL8 CHECK OPERATION OF TOP GEAR SWITCH		
• Key off, wait 10 seconds. • Top gear switch disconnected. • DVOM on 200 ohm scale. • Measure resistance of top gear switch while shifting the transmission from the highest gear to the next lower gear. • **Does circuit open and close?**	Yes ▶ No ▶	GO to KL9 . REPLACE top gear switch. VERIFY SIL operation.

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Shift Indicator Light (SIL) — Pinpoint Test KL

TEST STEP	RESULT ▶	ACTION TO TAKE
KL9 CHECK CONTINUITY OF SIL CIRCUIT		
• Key off. • Top gear switch disconnected. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 53 (Test Pin 51 on 1.9L CFI or Test Pin 17 on 1.9L EFI) and the processor side of the top gear switch vehicle harness connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	RECONNECT top gear switch. Shift transmission into highest gear. GO to KL10. SERVICE open circuit between the top gear switch and the processor. VERIFY SIL operation.
KL10 CHECK SIL CIRCUIT FOR SHORT TO GROUND		
• Key off. • Transmission in highest gear. • Breakout box installed and processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 53 (Test Pin 51 on 1.9L CFI or Test Pin 17 on 1.9L EFI) and Test Pin 60. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. RERUN Quick Test. SERVICE short to ground between top gear switch and processor (on 1.9L EFI, also CHECK STO circuit for short to ground). VERIFY SIL operation.

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WOT A/C Cutout (WAC) A/C Demand

Pinpoint Test

KM

Note

You should enter this Pinpoint Test only when directed here from Quick Test Step 7.0.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Fuse
- Non-Electrical A/C components
- Refrigerant charge
- Ambient temperature less than 45°

This Pinpoint Test is intended to diagnose only the following:

- Harness Circuits: WAC, VPWR, GROUND, POWER-TO-CLUTCH, ACD
- WAC Relay (-11433- or -13A025-) or A/C fan controller (-8C619-)
- Processor assembly (-12A650-)

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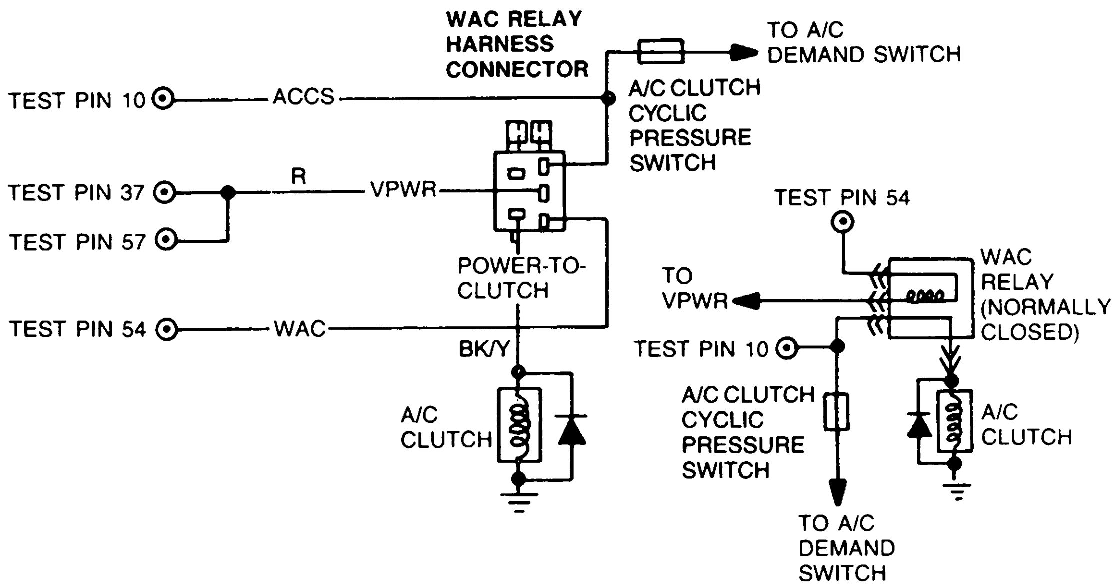
WOT A/C Cutout (WAC) A/C Demand

Pinpoint Test | **KM**

Pinpoint Test Schematic

APPLICATIONS: 3.8L SEFI RWD, 5.0L SEFI, 5.0L SEFI MA, 2.9L EFI TRUCK, 3.0L EFI TRUCK



A11536-B

Test Pin 10 — ACCS

Application	Color
3.8L SEFI RWD 5.0L SEFI MA 5.0L SEFI Except Mark VII	PK/LB
2.9L EFI Truck	T/Y
3.0L EFI Truck	BK/Y
5.0L SEFI Mark VII	LG/P

Test Pin 54 — WAC

Application	Color
3.8L SEFI RWD 5.0L SEFI 5.0L SEFI MA	O/LB
2.9L EFI Truck	P
3.0L EFI Truck	R

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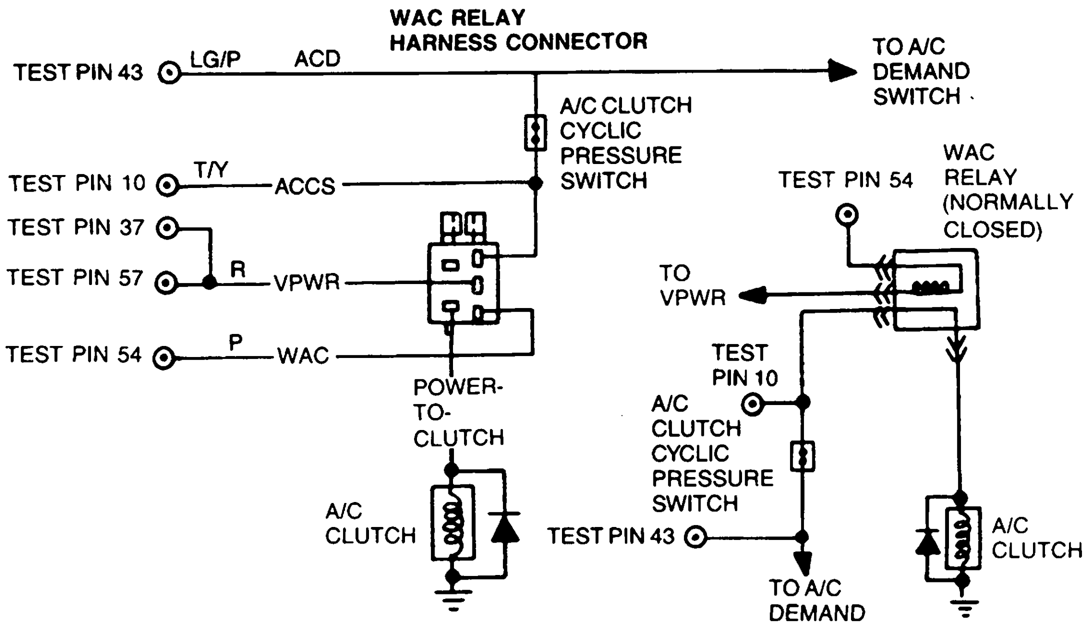
WOT A/C Cutout (WAC) A/C Demand

Pinpoint Test **KM**

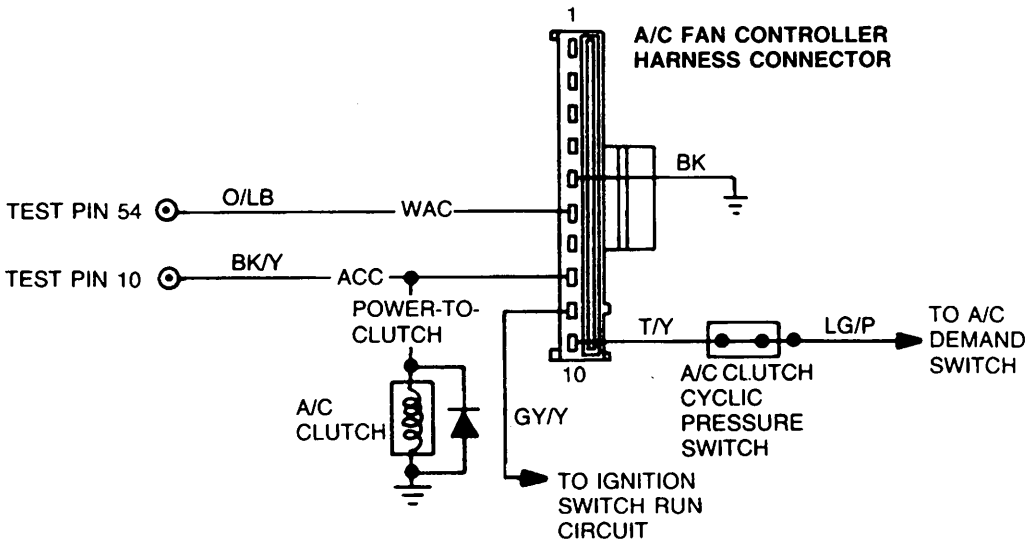
Pinpoint Test Schematic

APPLICATION: 2.3L EFI TRUCK



A11537-B

APPLICATIONS: 1.9L CFI, 1.9L EFI



A11538-B

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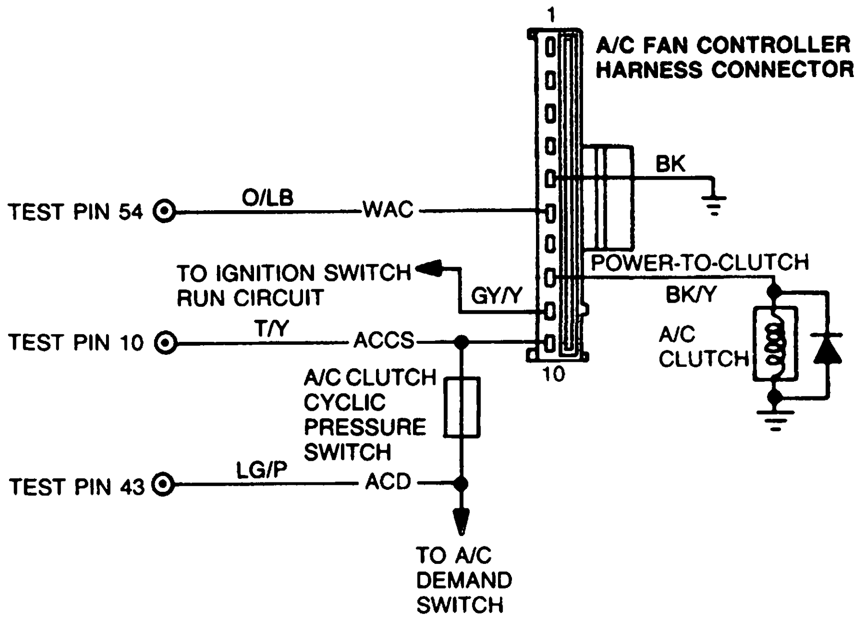
WOT A/C Cutout (WAC) A/C Demand

Pinpoint Test | **KM**

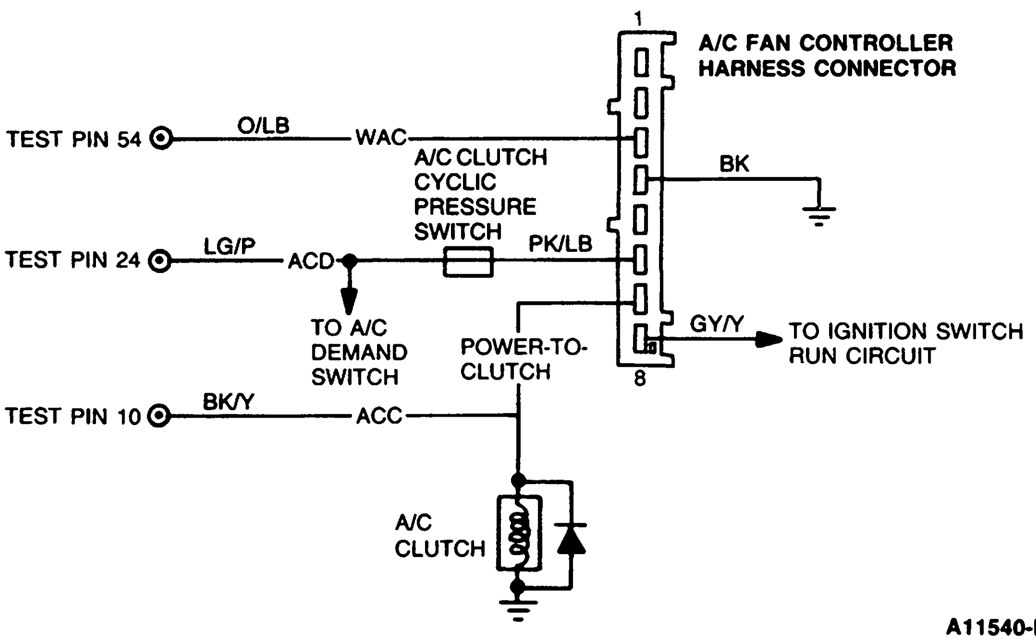
Pinpoint Test Schematic

APPLICATION: 2.3L HSC EFI



A11539-B

APPLICATIONS: 2.3L OHC EFI CAR



A11540-B

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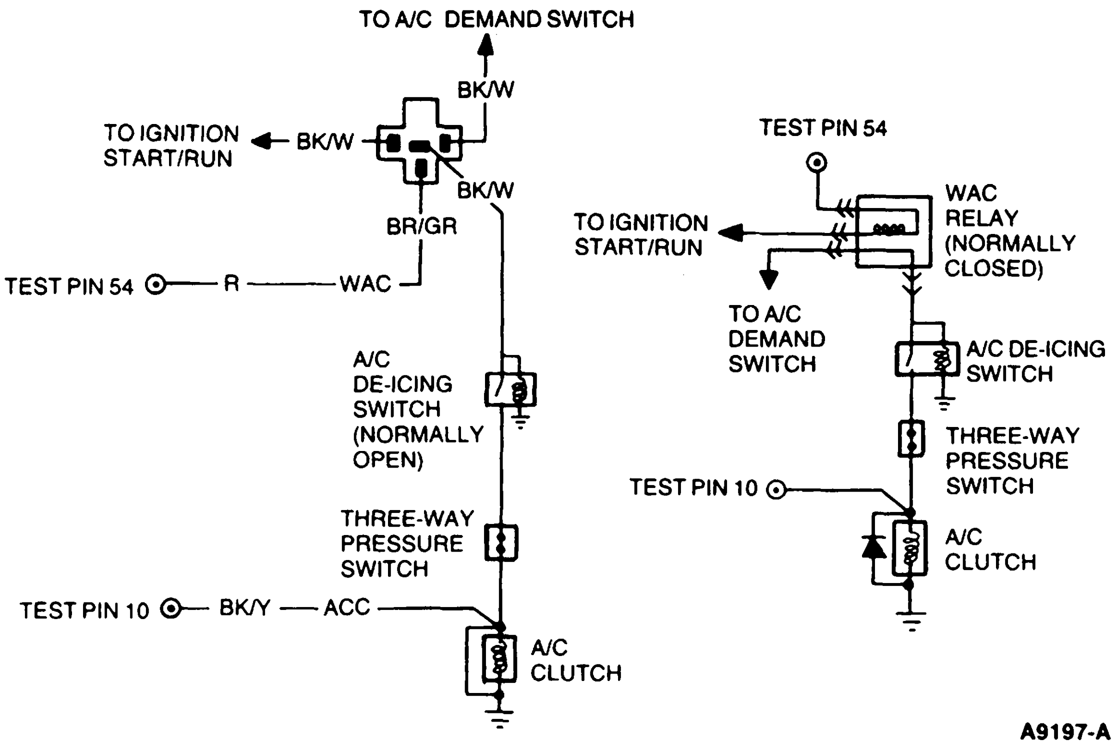
WOT A/C Cutout (WAC) A/C Demand

Pinpoint Test **KM**

Pinpoint Test Schematic

APPLICATION: 2.3L EFI TC



A9197-A

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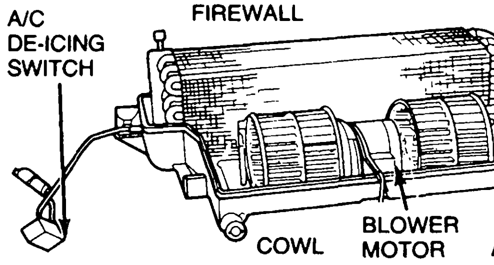
WOT A/C Cutout (WAC) A/C Demand

Pinpoint Test KM

TEST STEP	RESULT ▶	ACTION TO TAKE
KM1 NO A/C: CHECK FOR VOLTAGE AT A/C CLUTCH		
NOTE: Before proceeding with "NO A/C" diagnostics, verify integrity of related fuses in fuse panel. o Disconnect harness from A/C clutch. o A/C switch to A/C. o DVOM on 20 volt scale. o Start engine, wait 10 seconds. o Measure voltage between the power side of the A/C clutch harness connector and battery negative post. o **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	EEC-IV system OK. Refer to Shop Manual, Group 36, (Group 12 for Compact Truck) A/C Diagnosis. 2.3L EFI TC GO to KM2. ALL OTHERS, GO to KM5.
KM2 CHECK FOR VOLTAGE AT THE A/C DE-ICING SWITCH		
o Key off. o A/C clutch harness disconnected. o Disconnect harness from the A/C de-icing switch. o Turn A/C switch to ON position. o DVOM on 20 volt scale. o Start engine, wait 10 seconds. o Measure voltage between both power-from-WAC relay circuits at the A/C de-icing switch harness connector and chassis ground. o **Are both of the voltages greater than 10.5 volts?**	Yes ▶ No ▶	Key to off position. GO to KM4. RECONNECT A/C clutch harness. GO to KM3.



A9198-A

A/C DE-ICING SWITCH HARNESS CONNECTOR

NOTE: THE A/C DE-ICING SWITCH IS A NORMALLY OPEN RELAY

A9199-A

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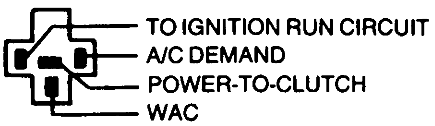
WOT A/C Cutout (WAC) A/C Demand

Pinpoint Test **KM**

TEST STEP	RESULT ▶	ACTION TO TAKE
KM3 CHECK CONTINUITY FROM THE WAC RELAY TO THE DE-ICING SWITCH		
• Key off. • A/C de-icing switch disconnected. • DVOM on 200 ohm scale. • Measure resistance between power-to-clutch circuit on the WAC relay harness connector and both power-from-WAC relay circuits on the A/C de-icing switch harness connector. • **Are both resistances less than 5.0 ohms?**	Yes ▶	GO to KM6 .
	No ▶	SERVICE open circuit. RECONNECT components. RE-EVALUATE symptom.



WIDE OPEN THROTTLE A/C CUTOUT (WAC) RELAY HARNESS CONNECTOR

A9200-A

TEST STEP	RESULT ▶	ACTION TO TAKE
KM4 CHECK CONTINUITY FROM A/C DE-ICING SWITCH TO THE A/C CLUTCH		
• Key off. • A/C clutch harness disconnected. • DVOM on 200 ohm scale. • Measure resistance between power side of the A/C clutch harness connector and the power-to-clutch pin at the A/C de-icing switch. • **Is resistance less than 5.0 ohms?**	Yes ▶	VERIFY ground circuit to A/C de-icing switch. If O.K., REFER to Shop Manual, Group 36 for A/C de-icing switch diagnosis.
	No ▶	VERIFY operation of Three Way Pressure Switch. REFER to Shop Manual, Group 36, A/C Diagnosis. If O.K., SERVICE open circuit. RECONNECT components. RE-EVALUATE symptom.

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WOT A/C Cutout (WAC) A/C Demand

Pinpoint Test KM

TEST STEP	RESULT ▶	ACTION TO TAKE
KM5 CHECK CONTINUITY OF POWER-TO-CLUTCH CIRCUIT		
NOTE: Applications with WAC relay: 2.3L EFI TC 3.8L EFI RWD, 5.0L SEFI, 5.0L SEFI MA, 2.3L EFI TRK, 2.9L EFI TRK, 3.0L EFI TRK. **Applications with A/C fan controller: 1.9L CFI, 1.9L EFI, 2.3L HSC, 2.3L EFI OHC car.** • Key off. • A/C clutch harness disconnected. • Disconnect harness from WAC relay or A/C FAN controller. • DVOM on 200 ohm scale. • Measure resistance between power side of the A/C clutch harness connector and POWER-TO-CLUTCH pin at the WAC relay or A/C fan controller harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	RECONNECT A/C clutch. GO to KM6 . SERVICE open circuit. RECONNECT A/C clutch and WAC relay or A/C fan controller. RE-EVALUATE symptom.
KM6 CHECK FOR POWER ON A/C DEMAND CIRCUIT		
• Key on, engine off. • WAC relay or A/C fan controller disconnected. • A/C switch to A/C. • DVOM on 20 volt scale. • Measure voltage between A/C demand input pin at WAC relay or A/C fan controller harness connector and chassis ground. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to KM7 . 2.3L EFI TC: VERIFY operation of A/C demand switch. If OK, SERVICE open circuit. ALL OTHERS: VERIFY operation of A/C clutch cyclic pressure switch and A/C demand switch. REFER to Shop Manual Group 36, (Group 12 Compact Truck) A/C Diagnosis. If OK, SERVICE open circuit. RECONNECT WAC relay or A/C fan controller. RE-EVALUATE symptom.

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WOT A/C Cutout (WAC) A/C Demand

Pinpoint Test | **KM**

TEST STEP	RESULT ▶	ACTION TO TAKE
KM7 CHECK FOR WAC CIRCUIT SHORT TO GROUND		
• Key off. • WAC relay or A/C fan controller disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. Leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between WAC circuit at the WAC relay or A/C fan controller harness connector and chassis ground. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	A/C fan controller applications: GO to KM8 . WAC relay applications: GO to KM10 . SERVICE short circuit. RECONNECT processor and WAC relay or A/C fan controller. RE-EVALUATE symptom.
KM8 CHECK FOR GROUND TO A/C FAN CONTROLLER		
• Key off. • A/C fan controller disconnected. • Processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between ground circuit at A/C fan controller harness connector and chassis ground. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to KM9 . SERVICE open circuit. RECONNECT processor and A/C fan controller. RE-EVALUATE symptom.
KM9 CHECK FOR VOLTAGE TO A/C FAN CONTROLLER		
• Key on. • A/C fan controller disconnected. • Processor disconnected. • DVOM on 20 volt scale. • Measure voltage between ignition switch RUN circuit at the A/C fan controller harness connector and chassis ground. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to KM10 . SERVICE open circuit. RECONNECT processor A/C fan controller. RE-EVALUATE symptom.

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WOT A/C Cutout (WAC) A/C Demand

Pinpoint Test KM

TEST STEP	RESULT ▶	ACTION TO TAKE
KM10 CHECK WAC RELAY, A/C FAN CONTROLLER		
• Key off. • Processor disconnected. • Reconnect WAC relay or A/C fan controller. • Disconnect harness from A/C clutch. • DVOM on 20 volt scale. • Key on, engine off. • A/C switch to A/C. • Measure voltage between the power side of the A/C clutch harness connector and the battery negative post. • **Is voltage greater than 10.5 volts?**	Yes ▶	REPLACE processor. RECONNECT A/C clutch. RE-EVALUATE symptom.
	No ▶	REPLACE WAC relay or A/C fan controller. RECONNECT processor and A/C clutch. RE-EVALUATE symptom.
KM15 NO A/C CUTOUT AT WOT: ENTER OUTPUT STATE CHECK (REFER TO QUICK TEST APPENDIX)		
NOTE: Do not use STAR tester for this Step, use VOM/DVOM. • Key off, wait 10 seconds. • DVOM on 20 volt scale. • Connect DVOM negative test lead to STO at the Self-Test connector and positive test lead to battery positive post. • Jumper STI to SIGNAL RETURN at the Self-Test connector. • Perform Key On Engine Off Self-Test until the completion of the Continuous Memory Codes. • DVOM will indicate less than 1.0 volt when test complete. • Depress and release the throttle. • **Does voltage increase to greater than 10.5 volts?**	Yes ▶	REMAIN in Output State Check. GO to KM16.
	No ▶	DEPRESS throttle to WOT and RELEASE. If STO voltage does not go high, GO to Pinpoint Test Step QC2. Leave equipment hooked up.

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WOT A/C Cutout (WAC) A/C Demand

Pinpoint Test KM

TEST STEP	RESULT ▶	ACTION TO TAKE
KM16 WAC RELAY OR A/C FAN CONTROLLER		
• WAC relay applications: 2.3L EFI TC, 3.8L SEFI RWD, 5.0L SEFI, 5.0L SEFI MA, 2.3L EFI TRK, 2.9L EFI TRK, 3.0L EFI TRK. • A/C fan controller applications: 1.9L CFI, 1.9L EFI, 2.3L EFI HSC, 2.3L EFI OHC car.	WAC relay ▶ A/C fan controller ▶	GO to KM17. GO to KM22.
KM17 CHECK FOR VPWR TO RELAY		
• Still in output state check. • Disconnect harness from WAC relay. • DVOM on 20 volt scale. • Measure voltage between VPWR circuit (START/RUN for 2.3L EFI TC) at the WAC relay harness connector and chassis ground. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to KM18. SERVICE open in VPWR circuit between power relay and WAC relay (for 2.3L EFI TC, START/RUN circuit between WAC relay and fuse panel). RECONNECT WAC relay and REMOVE jumper. RE-EVALUATE symptom.
KM18 CHECK FOR WAC CYCLING		
• Still in output state check. • WAC relay disconnected. • DVOM on 20 volt scale. • Connect DVOM positive test lead to the VPWR circuit (START/RUN for 2.3L EFI TC) and the negative test lead to the WAC circuit at the WAC relay harness connector. • While observing DVOM, depress and release throttle several times (to cycle output on and off). • **Does voltage cycle high and low?**	Yes ▶ No ▶	REPLACE WAC relay. REMOVE jumper. RE-EVALUATE symptom. REMOVE jumper. GO to KM19.

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WOT A/C Cutout (WAC) A/C Demand

Pinpoint Test KM

TEST STEP	RESULT ▶	ACTION TO TAKE
KM19 CHECK CONTINUITY OF WAC CIRCUIT		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • WAC relay disconnected. • Measure resistance between Test Pin 54 at the breakout box and WAC circuit at the WAC relay harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to KM20 . SERVICE open circuit. REMOVE breakout box. RECONNECT processor and WAC relay. RE-EVALUATE symptom.
KM20 CHECK FOR SHORT TO POWER		
• Key off. • Breakout box installed, processor disconnected. • WAC relay disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 54 and Test Pins 37 and 57 at the breakout box. • **Are both resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. RECONNECT WAC relay. RE-EVALUATE symptom. SERVICE short circuit. REMOVE breakout box. RECONNECT processor and WAC relay. RE-EVALUATE symptom. IF symptom is still present, REPLACE processor.
KM22 CHECK FOR WAC CYCLING		
• Still in output state check. • Disconnect A/C fan controller. • DVOM on 20 volt scale. • Connect DVOM positive test lead to the Ignition Run circuit and the negative test lead to the WAC circuit at the A/C fan controller harness connector. • While observing DVOM, depress and release throttle several times (to cycle output on and off). • **Does voltage cycle high and low?**	Yes ▶ No ▶	REPLACE A/C fan controller. REMOVE jumper. RE-EVALUATE symptom. REMOVE jumper. GO to KM23 .

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WOT A/C Cutout (WAC) A/C Demand

Pinpoint Test | **KM**

TEST STEP	RESULT ▶	ACTION TO TAKE
KM23 CHECK CONTINUITY OF WAC CIRCUIT		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • A/C fan controller disconnected. • Measure resistance between Test Pin 54 at the breakout box and WAC circuit at the WAC relay harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to KM24 . SERVICE open circuit. REMOVE breakout box. RECONNECT processor and A/C fan controller. RE-EVALUATE symptom.
KM24 CHECK FOR SHORT TO POWER		
• Key off. • Breakout box installed, processor disconnected. • A/C fan controller disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 54 and Test Pins 37 and 57 at the breakout box. • **Are both resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. RECONNECT A/C fan controller. RE-EVALUATE symptom. SERVICE short circuit. REMOVE breakout box. RECONNECT processor and A/C fan controller. RE-EVALUATE symptom. If symptom is still present, REPLACE processor.
KM30 CYCLE A/C DEMAND SWITCH		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 20 volt scale. • Key on, engine off. • Connect DVOM positive test lead to Test Pin 43 (Test Pin 24 for 2.3L OHC EFI) and negative test lead to Test Pin 40. • **Does voltage cycle high and low when A/C switch is cycled?**	Yes ▶ No ▶	REMOVE breakout box. REPLACE processor. RERUN Quick Test. GO to KM31 .

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WOT A/C Cutout (WAC) A/C Demand

Pinpoint Test KM

TEST STEP	RESULT ▶	ACTION TO TAKE
KM31 CHECK CONTINUITY OF ACD CIRCUIT		
∘ Key off, wait 10 seconds. ∘ DVOM on 200 ohm scale. ∘ Measure resistance between Test Pin 43 (Test Pin 24 for 2.3L OHC EFI) at the breakout box and A/C demand switch. ∘ **Is resistance greater than 5 ohms?**	Yes ▶	SERVICE open in ACD circuit. RERUN Quick Test.
	No ▶	EEC-IV system OK. REFER to Shop Manual, Group 36 (Group 12 Compact Truck).
KM35 CHECK ACD CIRCUIT FOR SHORT TO POWER		
∘ Key off. ∘ Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. ∘ Install breakout box, leave processor disconnected. ∘ Disconnect WAC relay (TRK) or A/C fan controller (CAR). ∘ A/C demand switch "OFF". ∘ DVOM on 20 volt scale. ∘ Key on. ∘ Measure voltage between Test Pin 24 (Test Pin 43 for 2.3L EFI TC) at the breakout box and chassis ground. ∘ **Is voltage less than 1.0 volt?**	Yes ▶	EEC-IV system OK. REFER to Shop Manual, Group 36 (Group 12 Compact Truck).
	No ▶	VERIFY operation of A/C demand switch. IF OK, SERVICE short circuit. REMOVE breakout box. RECONNECT processor and WAC relay or A/C fan controller. RE-EVALUATE symptom.

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Octane Adjust

Pinpoint Test **KP**

Note

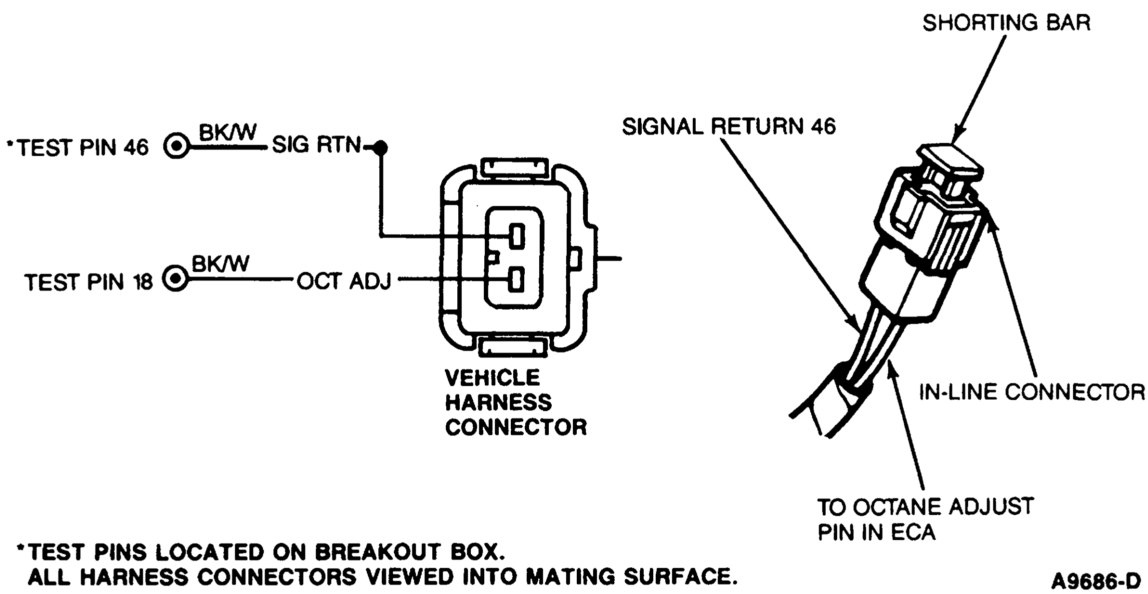
You should enter this Pinpoint Test only when directed here from Diagnostic By Symptom in the Engine Supplement Section.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: VPWR, Octane Adjust
- Octane shorting bar connector

Pinpoint Test Schematic



The purpose of the Octane Adjust Shorting Bar is to produce effective combustion using optimum spark advance.

- If the vehicle detonates (spark knock), remove the Octane Adjust Shorting Bar. This will retard spark an additional three to four degrees.
- If the vehicle continues to detonate (spark knock), use a higher grade of octane fuel.

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Supercharger Bypass Solenoid (SBS) | Pinpoint Test | KS

Note

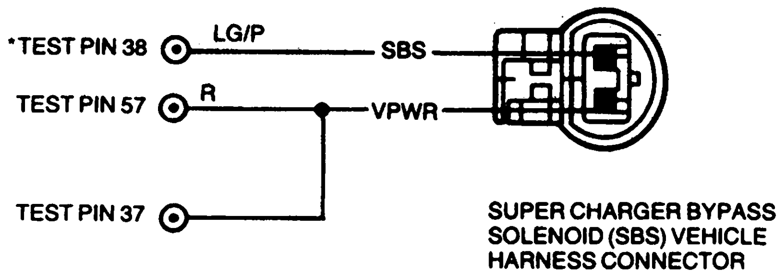
You should enter this Pinpoint Test only when a Service Code 82 is received or when directed here from Quick Test Step 7.0.

Remember

This Pinpoint Test is intended to diagnose only the following:

- SBS Harness Circuits
- Supercharger Bypass Solenoid (-9H465-)
- Processor Assembly (-12A650-)

Pinpoint Test Schematic



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9201-A

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Supercharger Bypass Solenoid (SBS) — Pinpoint Test KS

TEST STEP		RESULT ▶	ACTION TO TAKE
KS1	SERVICE CODE 82: CHECK SOLENOID RESISTANCE		
	Service Code 81 indicates that the voltage output for the **SUPERCHARGER BYPASS SOLENOID (SBS)** did not change when activated during Key On Engine Off Self-Test. Possible causes are: — Open or grounded SBS circuit — Open or grounded processor driver — Disconnected or open solenoid • Key Off. • DVOM on 200 ohm scale. • Disconnect SBS connector and measure solenoid resistance. • **Is solenoid resistance between 50 and 100 ohms?**	Yes ▶ No ▶	GO to KS2 . REPLACE SBS. RERUN Quick Test.
KS2	CHECK VOLTAGE ON VPWR CIRCUIT		
	• Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between SBS VPWR circuit and BATTERY GROUND. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to KS3 . SERVICE harness circuit open. RERUN Quick Test.
KS3	CHECK CONTINUITY OF SBS CIRCUIT		
	• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 38 at the breakout box and SBS circuit at vehicle harness. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to KS4 . RECONNECT processor and SBS. SERVICE open harness circuit. RERUN Quick Test.
KS4	CHECK FOR SHORT TO GROUND		
	• DVOM on 200,000 ohm scale. • Breakout box installed, processor disconnected. • Disconnect SBS. • Measure resistance between Test Pin 38 and Test Pin 40, 46, 60 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to KS5 . SERVICE short to ground. RERUN Quick Test.

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Supercharger Bypass Solenoid (SBS) | Pinpoint Test | KS

TEST STEP	RESULT ▶	ACTION TO TAKE
KS5 CHECK FOR SHORT TO POWER		
• Key off. • DVOM on 200,000 ohm scale. • Breakout box installed, processor disconnected. • SBS disconnected. • Measure resistance between Test Pin 38 and Test Pin 1 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT SBS. REPLACE processor. RERUN Quick Test. SERVICE short to power. RERUN Quick Test. IF code is still present, REPLACE processor.
KS6 CHECK SUPERCHARGE BYPASS VALVE		
• Key off. • Disconnect vacuum line from Supercharger bypass valve. • Apply 16 in-Hg (53 kPa) to valve. • **Does valve hold vacuum?**	Yes ▶ No ▶	GO to KS7. REPLACE supercharger bypass valve. RECONNECT vacuum hose. RERUN Quick Test.
KS7 CHECK SUPERCHARGER BYPASS VALVE ASSEMBLY		
• Key off • While applying vacuum to valve visually monitor valve and linkage assembly. • **Does valve and linkage assembly move properly?**	Yes ▶ No ▶	GO to KS8. SERVICE as necessary. RERUN Quick Test.
KS8 CHECK VACUUM TO BYPASS VALVE		
• Key off. • Inspect vacuum hose between Supercharger valve and SBS for; cracks, kinks, blockages and properly fitted. • **Is vacuum hose OK?**	Yes ▶ No ▶	GO to KS9. CHECK hose. SERVICE as necessary. RERUN Quick Test.
KS9 CHECK SERVICE VACUUM		
• Disconnect source vacuum hose from SBS. • Start engine. • Check for vacuum. • **Is vacuum present at source vacuum hose?**	Yes ▶ No ▶	REPLACE SBS. RERUN Quick Test. SERVICE vacuum source blockage or leak. RERUN Quick Test.

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Intake Air Control Valve (IAC) System

Pinpont Test **KT**

Note

You should enter this Pinpoint Test only when a Service Code 81 is received in Quick Test Step 3.0 or when directed here from Quick Test Step 7.0.

Remember

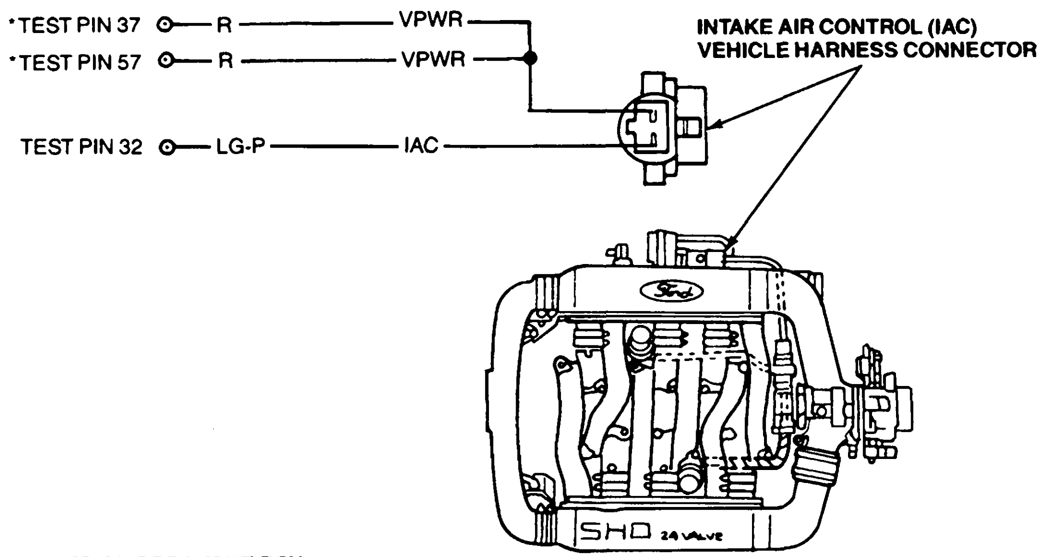
To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Vacuum tank leaks
- Vacuum hose leaks

This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: VPWR, Intake Air Control Assembly (-9H465-)
- Processor Assembly (-12A650-)

Pinpoint Test Schematic



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

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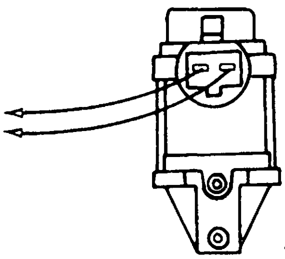
Intake Air Control Valve (IAC) System | Pinpont Test | KT

TEST STEP	RESULT ▶	ACTION TO TAKE
KT1 SERVICE CODE 81: CHECK SOLENOID RESISTANCE		
Service Code 81 indicates that the intake air control solenoid output voltage did not change when activated during Key-On Engine Off Self-Test. Possible causes are: — Intake air solenoid circuit open — Intake air solenoid circuit short — Intake air solenoid disconnected — Processor output driver open/grounded o Key off, wait 10 seconds. o DVOM on 200 ohm scale. o Disconnect intake air solenoid connector. o Measure intake air solenoid resistance. o **Is resistance between 50 and 100 ohms?**  	Yes ▶ No ▶	GO to [KT2]. REPLACE intake air control solenoid. RERUN Quick Test.
KT2 CHECK VOLTAGE OF VPWR CIRCUIT		
o Key on, engine off. o Intake air solenoid disconnected. o DVOM on 20 volt scale. o Measure voltage between VPWR circuit of intake air solenoid harness connector and battery negative post. o **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to [KT3]. RECONNECT intake air solenoid. SERVICE harness open circuit. RERUN Quick Test.

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Intake Air Control Valve (IAC) System

Pinpont Test KT

TEST STEP	RESULT ▶	ACTION TO TAKE
KT3 CHECK CONTINUITY OF INTAKE AIR SOLENOID CIRCUIT		
• Key off, wait 10 seconds. • Intake air solenoid disconnected. • Disconnect processor 60 pin connector. Inspect for damaged pins, corrosion, loose wires etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 32 at the breakout box and the intake air solenoid circuit at the vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to KT4. REMOVE breakout box. RECONNECT components. SERVICE open circuit. RERUN Quick Test.
KT4 CHECK FOR SHORT TO GROUND		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • Intake air solenoid disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 32 and Test Pins 40, 46, and 60 at the breakout box. • **Is resistance greater than 100,000 ohms?**	Yes ▶ No ▶	GO to KT5. REMOVE breakout box. RECONNECT components. SERVICE short circuit. RERUN Quick Test.
KT5 CHECK FOR SHORT TO POWER		
• Key off, wait 10 seconds. • DVOM on 200,000 ohm scale. • Breakout box installed, processor disconnected. • Intake air solenoid disconnected. • Measure resistance between Test Pin 32 and Test Pins 37 and 57 at the breakout box. • **Is resistance greater than 100,000 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT components. REPLACE processor. RERUN Quick Test. REMOVE breakout box. RECONNECT components. SERVICE short circuit. RERUN Quick Test. If symptom is still present, REPLACE the processor.

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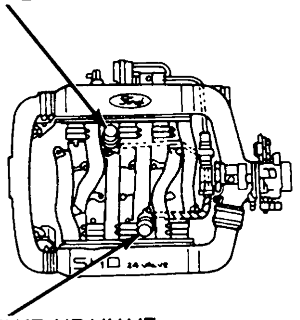
Intake Air Control Valve (IAC) System

Pinpont Test

KT

TEST STEP		RESULT ▶	ACTION TO TAKE
KT6	CHECK FRONT AND REAR INTAKE AIR VALVES		
	• Key off. • Disconnect vacuum lines from both intake air valves. • Install vacuum pump at each intake air valve. • Apply 10 in-Hg vacuum to each of the intake air valves. • **Did both intake air valves hold vacuum?** 	Yes ▶ No ▶	GO to KT7. REMOVE vacuum pumps. REPLACE intake air valves as necessary. RECONNECT vacuum lines to both intake air valves. RERUN Quick Test.
KT7	CHECK BOTH INTAKE AIR VALVE ASSEMBLIES		
	• Key off. • Apply 10 in-Hg vacuum to both intake air valves. • **Did both of the valves and valve mechanical linkages move in response to the applied vacuum?**	Yes ▶ No ▶	GO to KT8. SERVICE as necessary. RERUN Quick Test.

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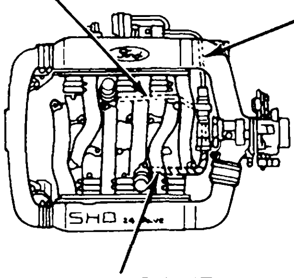
Intake Air Control Valve (IAC) System

Pinpont Test — **KT**

TEST STEP	RESULT ▶	ACTION TO TAKE
KT8 CHECK VACUUM TO BOTH INTAKE AIR VALVES		
• Key off. • Check the vacuum lines from the front and rear intake air valves to the intake air solenoid. Inspect for holes, kinks, disconnections and blockages. • **Are vacuum lines O.K.?**	Yes ▶ No ▶	GO to KT9 . SERVICE vacuum lines as necessary. RERUN Quick Test.
KT9 CHECK SOURCE VACUUM TO INTAKE AIR SOLENOID		
• Disconnect intake air solenoid manifold vacuum hose. • Start engine. • Check for vacuum at the disconnected manifold hose. • **Is vacuum present at the hose?**	Yes ▶ No ▶	REPLACE intake air solenoid. RERUN Quick Test. INSPECT vacuum supply hose to intake air solenoid. SERVICE as necessary. RERUN Quick Test.



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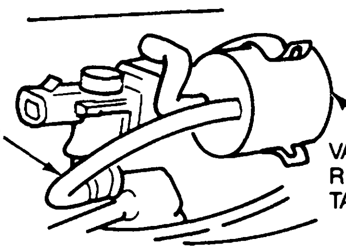

A12819-A

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Dynamic Response Test

Pinpont Test | **M**

Note

You should enter this Pinpoint Test only when a Service Code 77 is received in Quick Test Step 5.0.

Remember

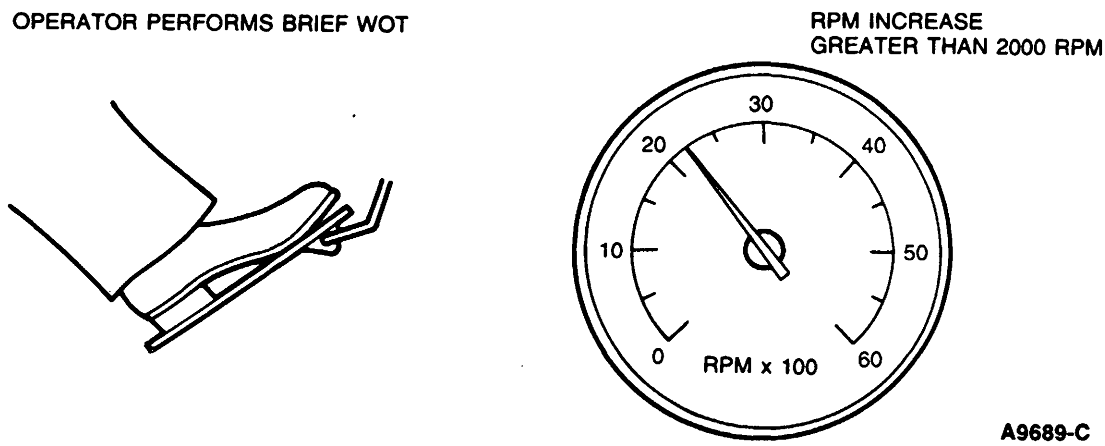
To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Operator did not perform a brief WOT after dynamic response code.
- Mechanical engine problems; engine did not achieve greater than 2000 rpm.

This Pinpoint Test is intended to diagnose only the following:

- Throttle movement (greater than 3/4 throttle)
- Vane Airflow (greater than 50 percent open)
- Rpm increase (greater than 2000 rpm)

Pinpoint Test Schematic



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Dynamic Response Test

Pinpont Test **M**

TEST STEP	RESULT ▶	ACTION TO TAKE
M1 SERVICE CODE 77: SYSTEM FAILED TO RECOGNIZE BRIEF WOT		
NOTE: A brief snap of the throttle may not be sufficient to pass this test. Be sure to go to WOT and return. • Rerun Engine Running Self-Test. Be sure operator is familiar with the engine running format which proceeds as follows: — Start engine. — Activate Seft-Test. — ID Code 2 (0) start of test. — Dynamic response Code 1 (0) perform brief WOT. — Testing over. — Service code output begins. • **Is Code 77 still present?**	Yes ▶ No ▶	REPLACE processor. RERUN Quick Test. Dynamic Response Test passed. SERVICE any other service code(s) received as necessary.

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"CHECK ENGINE" Light/Message "CHECK ENGINE"/"CHECK DCL" Message

Pinpoint Test

ML

Note

You should enter this Pinpoint Test only when a Service Code 70, 71, 72 is received in Quick Test Step 6.0 or when directed here from Pinpoint Test QA or Quick Test Step 7.0.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Fuse, bulb or socket.

This Pinpoint Test is intended to diagnose only the following:

- STO/MIL circuit (All except 1.9L EFI and 3.8L SEFI Continental)
- MIL circuit (1.9L EFI only)
- Processor assembly
- Data Communications Link (DCL) (3.8L SEFI Continental only)

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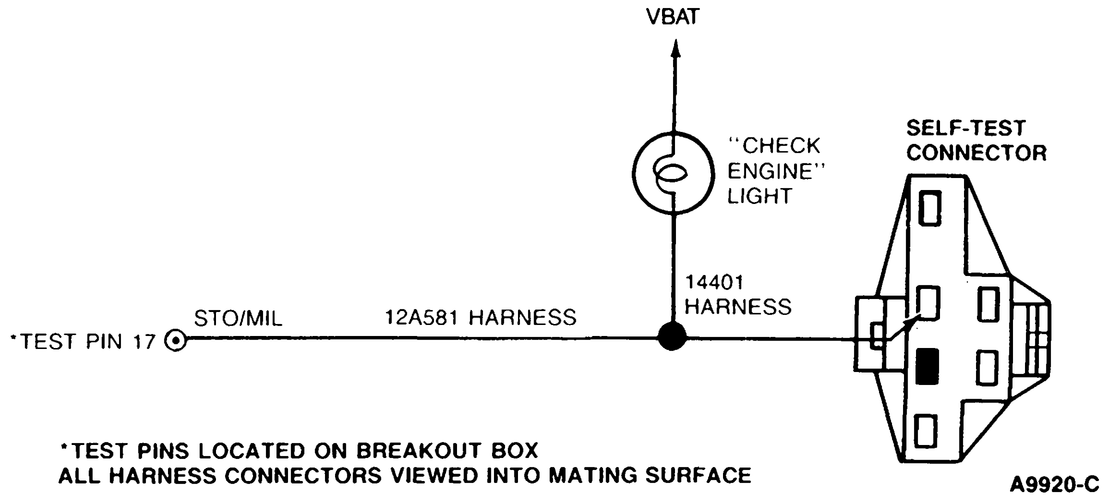
"CHECK ENGINE" Light/Message "CHECK ENGINE"/"CHECK DCL" Message

Pinpoint Test | **ML**

Pinpoint Test Schematic

ALL EXCEPT 1.9L EFI AND 3.8L SEFI CONTINENTAL



Test Pin 17 — STO/MIL

Application	Wire Colors
3.8L RWD SEFI 3.8L SC SEFI 5.0L SEFI Mark VII	Y/BK
2.3L OHC EFI 5.0L SEFI-MA	T
F-Series/Bronco: 4.9L EFI, 5.0L EFI, 5.8L EFI 7.5L EFI 7.3L Diesel F-Series	PK/LG
All Others	T/R

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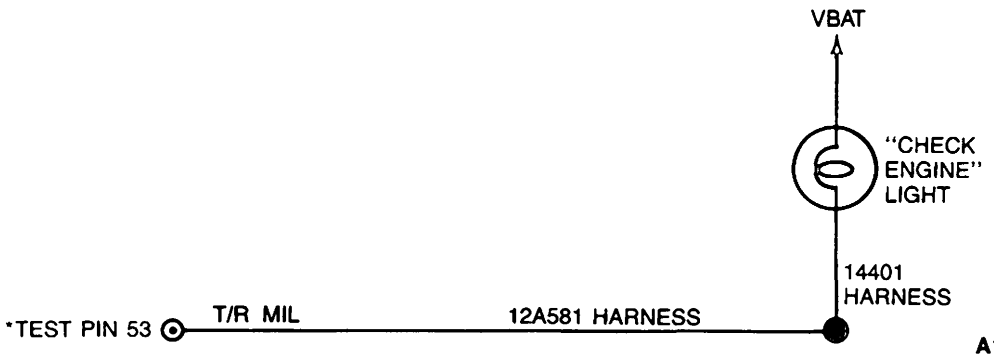
"CHECK ENGINE" Light/Message
"CHECK ENGINE"/"CHECK DCL" Message

Pinpoint Test | **ML**

Pinpoint Test Schematic

1.9L EFI



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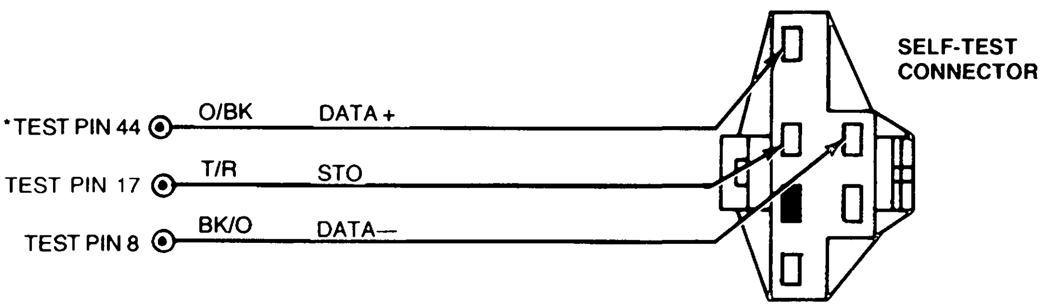
3.8L SEFI CONTINENTAL



*TEST PINS LOCATED ON BREAKOUT BOX
HARNESS CONNECTOR VIEWED INTO MATING SURFACE.

A11607-B

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"CHECK ENGINE" Light/Message "CHECK ENGINE"/"CHECK DCL" Message | Pinpoint Test | ML

TEST STEP	RESULT ▶	ACTION TO TAKE
ML1 "CHECK ENGINE" LIGHT ALWAYS ON: CHECK FOR SHORT TO GROUND		
NOTE: If vehicle will not start go to Pinpoint Test Step [A1]. • **If any Key On Engine Off service codes or Continuous Memory Codes are present, service before proceeding. If no codes are outputted, continue with this Test Step.** • Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 17 (Test Pin 53 on 1.9L EFI) and Test Pin 40 at the breakout box. • **Is resistance less than 10,000 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT processor. SERVICE short circuit between Test Pin 17/53 and "Check Engine" Light, or between Test Pin 17 and the Self-Test Connector. RERUN Quick Test. REMOVE breakout box. REPLACE processor. RERUN Quick Test.
ML5 "CHECK ENGINE" LIGHT NEVER ON: CHECK CONTINUITY OF STO/MIL CIRCUIT		
NOTE: If vehicle will not start go to Pinpoint Test Step [A1]. **Refer to Quick Test Appendix for a detailed description of how the "CHECK ENGINE" light (malfunction indicator light) operates.** • Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 17 (Test Pin 53 on 1.9L EFI) and the "CHECK ENGINE" light. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to [ML6]. REMOVE breakout box. RECONNECT processor. SERVICE OPEN circuit. RERUN Quick Test.
ML6 CHECK FOR POWER TO BULB		
• Check for power to "CHECK ENGINE" light bulb. • **Is there power at the light bulb?**	Yes ▶ No ▶	REPLACE bulb or socket. GO to [ML7]. CHECK fuse and VBAT input circuit. GO to [ML7].

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"CHECK ENGINE" Light/Message "CHECK ENGINE"/"CHECK DCL" Message | Pinpoint Test | ML

TEST STEP	RESULT ▶	ACTION TO TAKE
ML7 CONFIRM CIRCUIT REPAIR		
o Reconnect processor. o Turn key to run. o **Is "CHECK ENGINE" light ON?**	Yes ▶ No ▶	System OK. REPLACE processor.
ML10 "CHECK ENGINE" LIGHT INTERMITTENTLY ON: CHECK FOR INTERMITTENT STO SHORT TO GROUND		
NOTE: If vehicle will not start go to Pinpoint Test Step [A1]. **The "CHECK ENGINE" light will come ON when there is a Continuous Memory Code present. Service any Continuous Memory Codes before proceeding.** (See Quick Test Appendix for description of "CHECK ENGINE" light function.) If no codes are outputted, continue with this Test Step. o Enter Key On Engine Off Continuous Monitor Mode. Refer to Quick Test Appendix. o Observe VOM or STAR LED for indication of a fault while you wiggle, shake or bend a small section of the EEC-IV system harness in the following locations: — Harness closest to Self-Test connector to the dash panel — Dash panel to the processor — Dash panel to the "Check Engine" light o **Is a fault indicated?**	Yes ▶ No ▶	SERVICE short to ground. RERUN Quick Test. UNABLE to duplicate fault at this time. Testing complete.

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"CHECK ENGINE" Light/Message "CHECK ENGINE"/"CHECK DCL" Message

Pinpoint Test ML

TEST STEP	RESULT ▶	ACTION TO TAKE
ML15 "CHECK ENGINE" LIGHT FLASHING WITH ERRATIC IDLE: CHECK FOR STI SHORT TO GROUND		
NOTE: Vehicle symptoms indicate that STI is grounded and the vehicle is actually performing self-test without a tester installed. • Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • DVOM on 200,000 ohm scale. • Measure resistance between the SELF-TEST INPUT (STI) connector and engine block ground. • **Is resistance less than 10,000 ohms?**	Yes ▶ No ▶	SERVICE short circuit. RECONNECT processor. VERIFY symptom eliminated. RECONNECT processor. REVERIFY symptom. REFER to SECTION 2 for other rough idle routines.
ML20 "CHECK ENGINE" MESSAGE DISPLAYED		
NOTE: If vehicle is a no start, go to Pinpoint Test Step A1. **Refer to Quick Test Appendix for detailed description of how the "CHECK ENGINE" message operates.** • Run Key On Engine Off Self-Test. • **Is result 11-10-11 (Pass Codes)?**	Yes ▶ No ▶	GO to the Continental Shop Manual, Group 33 for DCL diagnostics. GO to Quick Test Step 3.0B. PROCEED as directed.

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"CHECK ENGINE" Light/Message "CHECK ENGINE"/"CHECK DCL" Message

Pinpoint Test ML

TEST STEP	RESULT ▶	ACTION TO TAKE
ML25 CONTINUOUS MEMORY CODE 70, 71, 72: "CHECK ENGINE"/"CHECK DCL" MESSAGE DISPLAYED		
Continuous Memory Codes 70, 71 and 72 indicate that a circuit failure has occurred on the Data Communications Link (DCL). These codes can appear alone or in conjunction with one another. The messages "CHECK ENGINE" and/or "CHECK DCL" will also be on. — Code 70 indicates that the EEC IV processor is unable to transmit data. — Code 71 indicates that the Cluster Control Assembly (CCA) is unable to transmit data. — Code 72 indicates that the Message Center Control Assembly (MCCA) is unable to transmit data. **NOTE: If vehicle is a no start, go to Pinpoint Test Step A1 .** **Refer to Quick Test Appendix for a detailed description of how the "CHECK ENGINE"/"CHECK DCL" message operates.** • Run Key On Engine Off Self-Test with a STAR tester or volt/ohmmeter. • **Is result 11-10-11 (Pass Codes)?**	Yes ▶	GO to Continental Shop Manual, Group 33 for DCL diagnostics.
	No ▶	GO to Quick Test Step 3.0B. PROCEED as directed.

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Ignition/Erratic Diagnostic Monitor (IDM)

Pinpoint Test N

Note

You should enter this Pinpoint Test only when a Service Code 14, 18, 19, 28, 45, 46, 48 or 88 is received in Quick Test Step 3.0 and 6.0 or when directed here from Quick Test Step 7.0.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- TFI or DIS ignition module
- Ignition coil or DIS coil pacts
- Spark plugs and high tension cables
- Distributor and PIP sensor
- Arcing of secondary ignition components

This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: IGNITION GROUND, SPOUT, PIP, IDM, DPI
- Procesor assembly (-12A650-)

NOTE: This Pinpoint Test is intended to diagnose TFI Ignition Systems, Closed Bowl Distributor (CBD) with remote mount TFI Systems and Distributorless Ignition Systems (DIS).
To identify your system, please refer to the application chart below.

Ignition System Application Chart

Ignition Connector	Vehicle Application
DIS Connector (pins 1-6 and 7-12)	2.3L OHC EFI, 3.0L SHO, 3.8L SC
Distributor Hall Connector and TFI Connector (used for Closed Bowl Distributor, Remote Mount TFI Systems)	3.8L RWD, 3.8L AXOD, 7.5L Truck
TFI Connector	All Others

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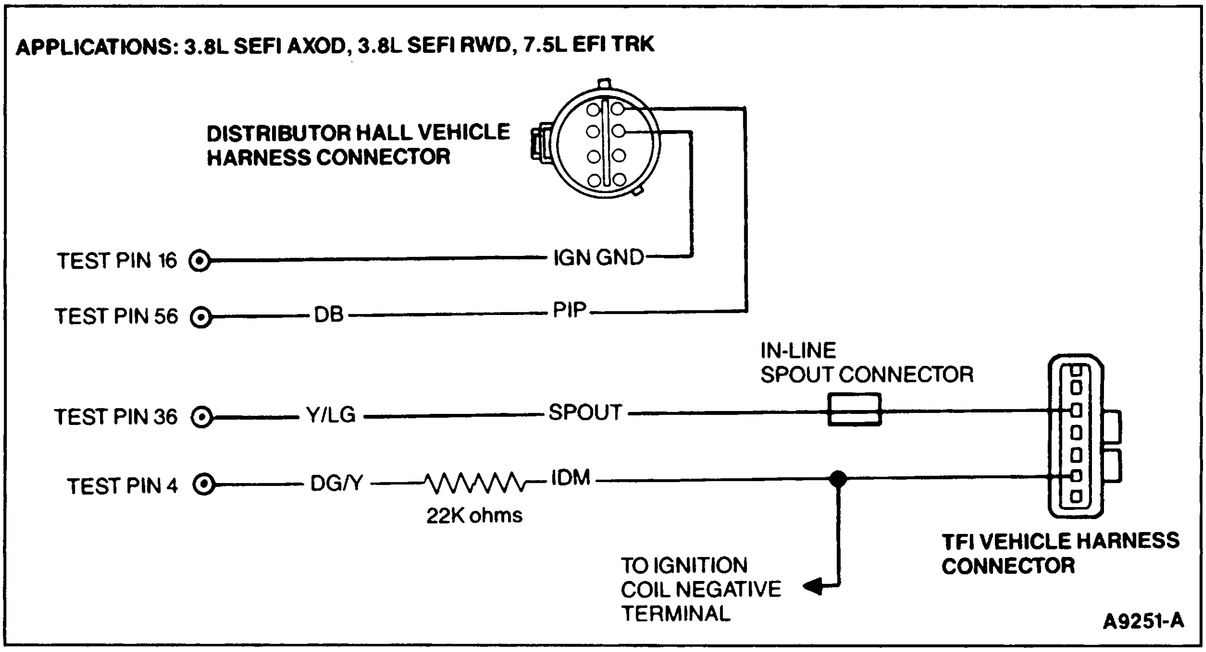
Ignition/Erratic Diagnostic Monitor (IDM)

Pinpoint Test **N**

Pinpoint Test Schematic



Test Pin 16 — Ignition Ground

Application	Wire Color
3.8L SEFI AXOD	GY
3.8L SEFI RWD 7.5L EFI TRK	BK/O

TFI Location

Application	Location
3.8L SEFI AXOD	Cowl
3.8L SEFI RWD	Radiator Support
7.5L EFI TRK	Distributor

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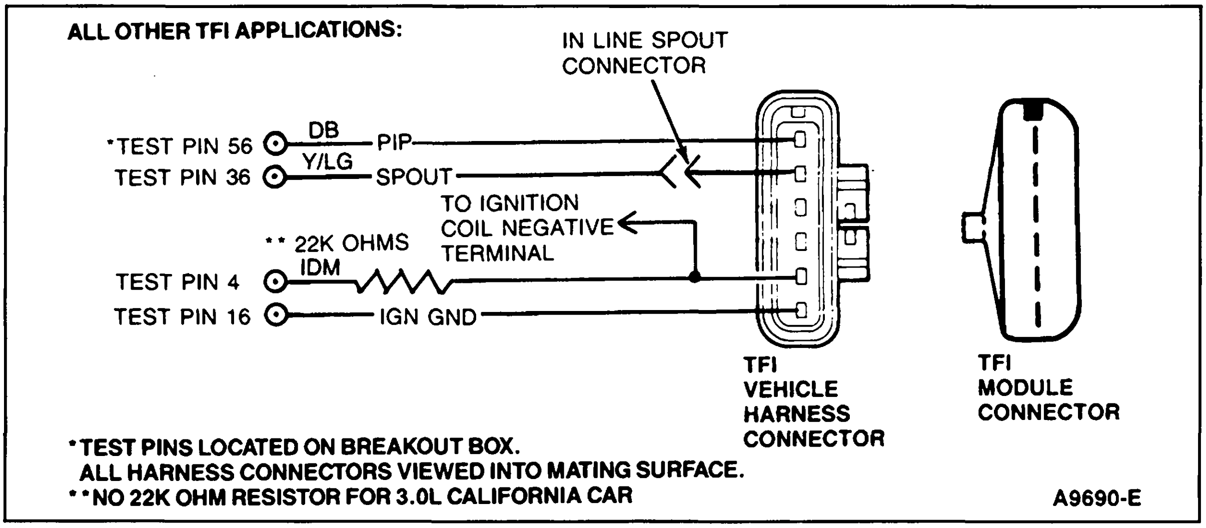
Ignition/Erratic Diagnostic Monitor (IDM)

Pinpoint Test N

Pinpoint Test Schematic



Test Pin 4	Ign. Gnd.
3.0L Car (Calif. only)	R/LB
All Others	DG/Y

Test Pin 16	Ign. Gnd.
3.0L, 3.8L AXOD	GY
2.3L Truck, 2.9L Truck	BK
2.3L Merkur	R/O
All Others	BK/O

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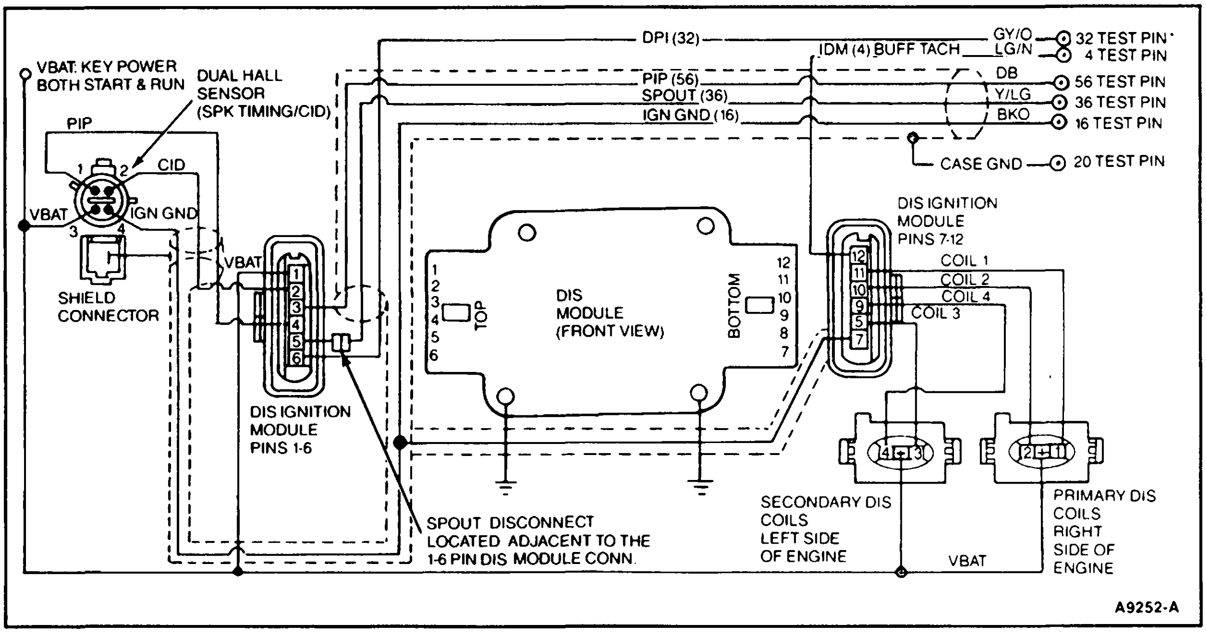
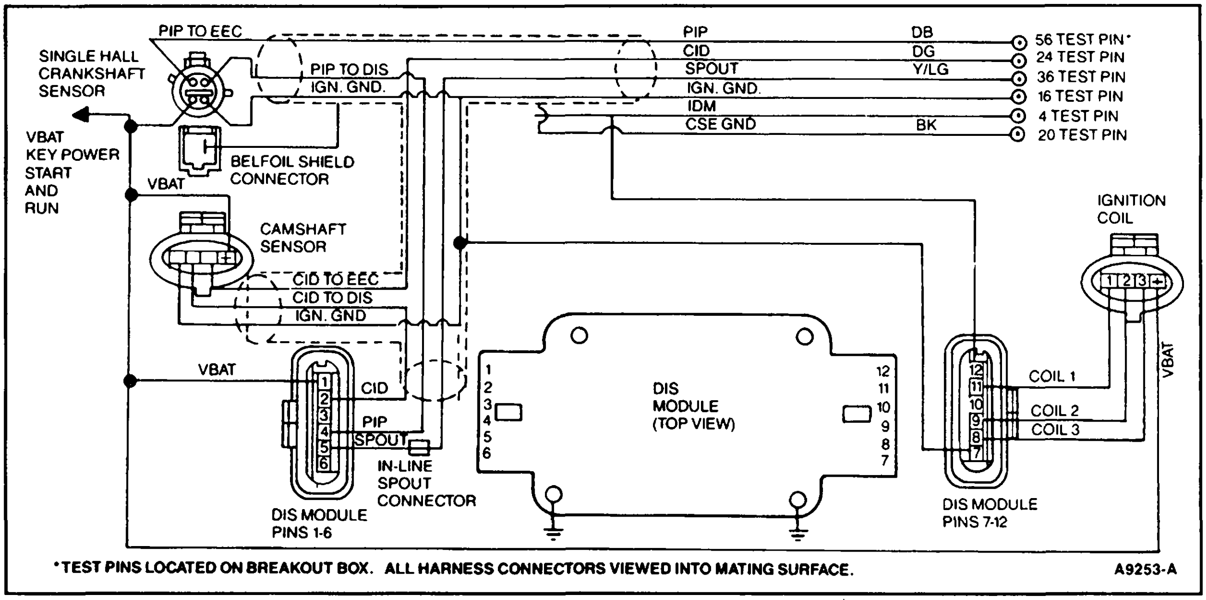
Ignition/Erratic Diagnostic Monitor (IDM)

Pinpoint Test N

2.3 OHC EFI Truck



3.0L SHO SEFI MA and 3.8L SEFI SC



*TEST PINS LOCATED ON BREAKOUT BOX. ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

Test Pin 4	IDM
3.0L SHO MA	GY/O
3.8L SC. MA	DG/Y

Test Pin 16	Ign. Gnd.
3.0L SHO MA	BK/O
3.8L SC MA	LB

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Ignition/Erratic Diagnostic Monitor (IDM)

Pinpoint Test N

TEST STEP	RESULT ▶	ACTION TO TAKE
N1 CONTINUOUS MEMORY CODE 14: ERRATIC IGNITION		
Code 14 indicates two successive erratic profile ignition pickup (PIP) pulses occurred, resulting in a possible engine miss or stall. Possible causes: — Loose wires/connectors. — Arcing secondary ignition components (coil, cap, rotor, wires, plugs, etc.). — On-board transmitter (2-way radio).* • **Are any of the above present?** *Verify all 2-way radio installations. Carefully follow manufacturer's installation instructions regarding the routing of antenna and power leads.	Yes ▶ No ▶	SERVICE as necessary. CLEAR Continuous Memory Code 14. REFER to Quick Test Appendix. RERUN Quick Test. GO to N4.
N2 CHECK FOR OTHER EEC CODES		
• **Are Continuous Memory Service Codes 45, 46 or 48 present?**	Yes ▶ No ▶	GO to N13. GO to N3.

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Ignition/Erratic Diagnostic Monitor (IDM) — Pinpoint Test N

TEST STEP		RESULT ▶	ACTION TO TAKE
N3	CONTINUOUS MEMORY CODE 18, 28 OR 48: CHECK CONTINUITY OF IDM CIRCUIT		
	Continuous Memory Code 18 indicates a loss of IDM processor input. Possible causes: — Open harness — Shorted harness — TFI or DIS module — Processor Continuous Memory Code 28 indicates IDM processor input always low. Possible causes: — Open harness — Shorted harness — CID sensor — VBAT low at DIS — DIS module — Processor Continuous Memory Code 48 indicates IDM processor input always high. Possible causes: — Open harness — VBAT open at secondary coil — VBAT low at secondary coil **NOTE: It is important to know that on TFI vehicles the IDM circuit has a 22,000 ohm resistor between Test Pin 4 and the Ignition Coil Negative Terminal (except for 3.0L California vehicles).** o Key off, wait 10 seconds. o Disconnect E-core ignition coil on TFI vehicles. For DIS vehicles, disconnect DIS module (pins 7-12). o Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o Install breakout box, leave processor disconnected. o DVOM on 200,000 ohm scale. <u>FOR TFI VEHICLES</u>: o Measure resistance between Test Pin 4 at the breakout box and ignition coil harness connector negative terminal. <u>FOR DIS VEHICLES:</u> o Measure resistance between Test Pin 4 at the breakout box and DIS module pin 12 harness connector. o **Is resistance between 20,000 and 24,000 ohms? (For DIS and 3.0L California vehicles is resistance less than 5.0 ohms?)**	Yes ▶ No ▶	GO to N4. REMOVE breakout box. RECONNECT processor. SERVICE open circuit. CLEAR Continuous Memory Codes. RERUN Quick Test. RECONNECT E-core ignition coil.

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Ignition/Erratic Diagnostic Monitor (IDM)

Pinpoint Test N

TEST STEP	RESULT ▶	ACTION TO TAKE
N4 CHECK IDM CIRCUIT FOR SHORT TO GROUND		
• Key off, wait 10 seconds. • E-core ignition coil disconnected on TFI vehicles. For DIS vehicles, DIS module pins 7-12 disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 4 and Test Pins 40, 46 and 60 at the breakout box. • **Are all resistances above 10,000 ohms?**	Yes ▶	RECONNECT E-core ignition coil and processor. GO to N5 .
	No ▶	REMOVE breakout box. SERVICE short to ground in IDM circuit. RECONNECT all components. CLEAR Continuous Memory Code. RERUN Quick Test.
N5 CHECK PROCESSOR FOR SHORT TO GROUND		
• Key off, wait 10 seconds. For TFI Vehicles: • E-core ignition coil disconnected. For DIS Vehicles: • Disconnect Pins 7-12 at DIS connector. • Breakout box installed. • Connect processor to breakout box. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 4 and Test Pin 40, 46, and 60 at the breakout box. • **Are all resistances greater than 10,000 ohms?**	Yes ▶	For TFI Vehicles: RECONNECT E-Core ignition coil. For DIS Vehicles: RECONNECT Pins 7-12. GO to N6 .
	No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Ignition/Erratic Diagnostic Monitor (IDM)

Pinpoint Test N

TEST STEP	RESULT ▶	ACTION TO TAKE
N6 CHECK IGNITION MODULE		
• Key off, wait 10 seconds. • Deactivate Self-Test. • Enter Engine Running Continuous Monitor Mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: • Lightly tap on TFI or DIS ignition (simulate road shock). • Wiggle TFI connector or both DIS connectors. (For 3.8L AXOD, 3.8L RWD and 7.5L truck, wiggle TFI and distributor hall connectors.) • **Is a fault indicated?**	Yes ▶	DISCONNECT and INSPECT connectors. If connector and terminals are good, REMOVE breakout box, RECONNECT all components and GO to Section 13, TFI or DIS Diagnostics. If ignition system checks out OK in Section 13, REPLACE processor.
	No ▶	GO to **N7**.
N7 CHECK EEC-IV HARNESS		
• While still in continuous monitor mode from Step N6, observe VOM or STAR LED for a fault indication while performing the following: • While looking for faults listed in the table below, grasp the harness close to the TFI connector or both DIS connectors. (For 3.8L AXOD, 3.8L RWD and 7.5L Truck, TFI and distributor hall connectors.) Wiggle, shake or bend a small section of the EEC-IV system harness while working your way to the other ignition system components and to the dash panel. Also wiggle, shake or bend the EEC-IV harness from the dash panel to the processor. Do this test on the circuits listed one at a time if needed to locate a faulty circuit.	Yes ▶	ISOLATE fault and make necessary repairs. REMOVE breakout box. DISCONNECT all components. CLEAR Continuous Memory Code. RERUN Quick Test.
	No ▶	GO to **N8**.

FAULT	BREAKOUT BOX NO.
PIP shorted to ground or open	Test Pin 56
Spout shorted to ground	Test Pin 36
Ign. ground open	Test Pin 16
IDM open or shorted to ground, power	Test Pin 4

• **Is a fault indicated?**

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Ignition/Erratic Diagnostic Monitor (IDM)

Pinpoint Test N

TEST STEP		RESULT ▶	ACTION TO TAKE
N8	CHECK PROCESSOR AND HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. • **Are connectors and terminals OK?**		Yes ▶	For Continuous Memory Code 14: Unable to duplicate an erratic ignition fault in the EEC-IV system. REMOVE breakout box. RECONNECT all components. For further diagnosis, GO to Section 13, DIS Diagnosis. For Continuous Memory Code 18: REPLACE processor. REMOVE breakout box. RECONNECT all components. Start engine and run for about one minute. RERUN Quick Test. For Continuous Memory Codes 28 and 48: REMOVE breakout box. RECONNECT all components. REFER to Section 13, DIS Diagnostics. If ignition system checks out OK in Section 13, REPLACE processor.
		No ▶	SERVICE as necessary. REMOVE breakout box. RECONNECT all components. CLEAR Continuous Memory Codes. REFER to Quick Test appendix. RERUN Quick Test.

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Ignition/Erratic Diagnostic Monitor (IDM)

Pinpoint Test N

TEST STEP		RESULT ▶	ACTION TO TAKE
N10	CONTINUOUS MEMORY CODE 19: CHECK CAMSHAFT SENSOR OUTPUT		
	Service Code 19 indicates that one of the two cylinder identification (CID) sensor output signals has failed. One of the outputs is input to the Distributorless Ignition System (DIS). The second output is input to the EEC-IV processor. Each output has a 50 percent duty cycle and an amplitude that varies from 0.4 volts to VBAT. Possible causes: — CID output line to processor open — CID output line to procesor shorted to ground — CID output line to processor shorted to power ∘ Key off. ∘ Disconnect processor 60 pin connector, inspect for damaged or pushed out pins, corrosion, loose wires, etc. ∘ Install breakout box and connect processor to breakout box. ∘ Key on engine running. ∘ DVOM on AC scale. ∘ Measure voltage between Test Pin 24 and GROUND. ∘ **Does voltage vary?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. GO to N11 .

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Ignition/Erratic Diagnostic Monitor (IDM) — Pinpoint Test N

TEST STEP	RESULT ▶	ACTION TO TAKE
N11 CHECK CID HARNESS FOR CONTINUITY		
• Key off. • Breakout box installed. • Disconnect processor. • Disconnect distributorless ignition module. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 24 at the breakout box and pin 2 (CID) at the DIS module connector. • **Is resistance less than 5 ohms?**	Yes ▶	GO to N12 .
	No ▶	SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
N12 CHECK CID CIRCUIT FOR SHORTS		
• Key off. • Breakout box installed, processor disconnected. • DIS module disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 24 and Test Pin 16, 37, 40 at the breakout box. • **Are all resistances greater than 10,000 ohms?**	Yes ▶	REMOVE breakout box. RECONNECT all components. GO to Section 13, TFI or DIS diagnostics.
	No ▶	SERVICE CID circuit for short to GROUND or POWER. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Ignition/Erratic Diagnostic Monitor (IDM)

Pinpoint Test **N**

TEST STEP		RESULT ▶	ACTION TO TAKE
N13	CONTINUOUS MEMORY CODES 45, 46 OR 48: CHECK CONTINUITY OF COIL CIRCUITS FROM DIS TO COIL PACK		
	Service Codes 45, 46 and 48 indicate a fault has been detected by the processor in one of the three coils contained in the ignition coil pack. **NOTE: Codes 45, 46 and 48 refer to faults detected in the circuits related to coils 3, 1 or 2 respectively. Coil 1 provides voltage for cylinder three and four spark plugs. Coil 2 provides voltage for cylinder two and six spark plugs. Coil 3 provides voltage for cylinder one and five spark plugs.** **The IDM pulse train contains a corresponding pulse for each operating coil. In the event that a coil fails, the corresponding pulse will be absent from the IDM pulse train.** Possible causes: — Open in coil circuit from DIS module to coil pack. — Shorts to coil circuit GROUND or POWER in DIS module. • Key off, wait 10 seconds. • Disconnect DIS module. • DVOM on 200 ohm scale. <u>For Service Code 45</u>: • Measure resistance between pin 8 at the DIS module and the coil 3 pin at the ignition coil pack. <u>For Service Code 46</u>: • Measure resistance between pin 11 at the DIS module and the coil 1 pin at the ignition coil pack. <u>For Service Code 48</u>: • Measure resistance between pin 9 at the DIS module and the coil 2 pin at the ignition coil pack. • **Are all resistances less than 5 ohms?**	Yes ▶ No ▶	GO to N14 . SERVICE open circuit. RECONNECT all components. RERUN Quick Test.

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Ignition/Erratic Diagnostic Monitor (IDM)

Pinpoint Test N

TEST STEP	RESULT ▶	ACTION TO TAKE
N14 CHECK COIL PACK CIRCUIT FOR SHORTS TO GROUND AND POWER		
• Key off. • DIS module disconnected pins 7-12. • Disconnect coil pack. • DVOM on 200,000 ohm scale. • Measure resistance between pin 7 and pins 8, 9 and 11 at the DIS module connector. • Measure resistance between pin 1 and pins 8, 9 and 11 at the DIS module connector. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REFER to Section 13 for DIS Diagnostics. SERVICE short circuit. RECONNECT all components. RERUN Quick Test.
N20 CONTINUOUS MEMORY CODE 88: CHECK CONTINUITY OF DPI CIRCUIT		
Continuous Memory Code 88 indicates an open in the dual plug inhibit (DPI) circuit or an open or short to ground in coil 4. Possible causes: — Open in harness — Short in harness — Processor — DIS module — Coil 4 • Key off, wait 10 seconds. • Disconnect DIS connector (pins 7-12) • Disconenct Processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between pin 6 at the DIS vehicle harness connector and Test Pin 32 at the breakout box. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT all components. REFER to Section 13, DIS Diagnostics. If ignition system checks OK in Section 13, REPLACE processor. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Ignition/Erratic Diagnostic Monitor (IDM)

Pinpoint Test N

TEST STEP		RESULT	ACTION TO TAKE
N25	SYMPTOM: HARD TO START CHECK DPI CIRCUIT FOR SHORT TO GROUND		
	• Key off, wait 10 seconds. • Disconnect DIS connector (pins 7-12). • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Insall breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 32 and Test Pins 40 and 60 at the breakout box. • **Is resistance greater than 100,000 ohms?**	Yes ▶ No ▶	Go to N26 . SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
N26	CHECK PROCESSOR FOR SHORT TO GROUND		
	• Key off, wait 10 seconds. • DIS connector (pins 7-12) disconnected. • Breakout box installed. • Connect processor to breakout box. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 32 and Test Pins 40 and 60 at the breakout box. • **Is resistance greater than 500 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT all components. GO to Section 13, DIS Diagnostics. REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Spark Timing Check

Pinpoint Test P

Note

You should enter this Pinpoint Test only when directed here from Quick Test Step 4.0, when a Service Code 18 is received in Quick Test Step 5.0 or a code 49 is received in Quick Test Step 6.0.

Remember

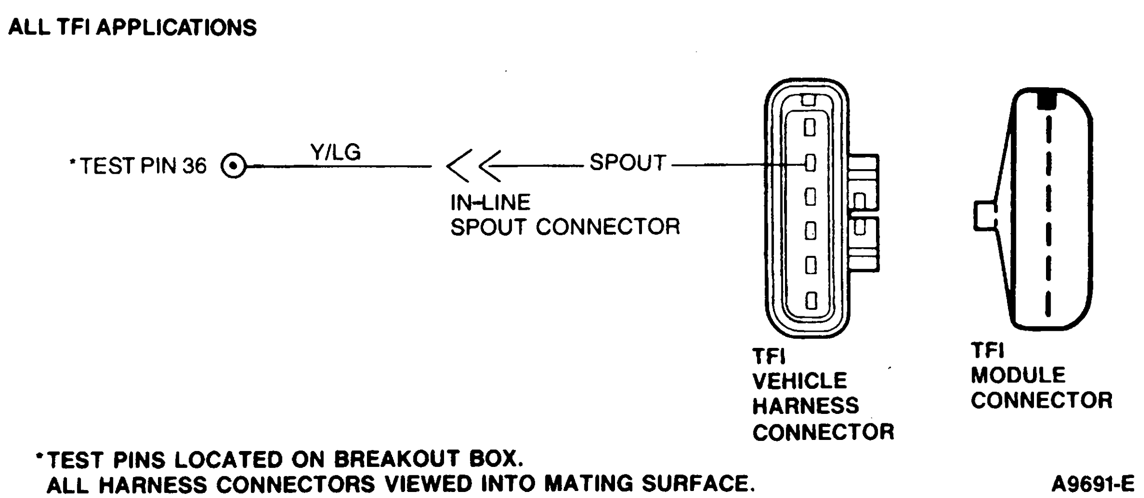
To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Base Engine
- Distributor
- TFI or DIS Module
- Camshaft Sensor (CID)
- Single Hall Crankshaft Sensor (PIP)
- Dual Hall Sensor

This Pinpoint Test is intended to diagnose only the following:

- Harness Spout Circuit
- Base Timing
- Processor Assembly (-12A650-)

Pinpoint Test Schematic



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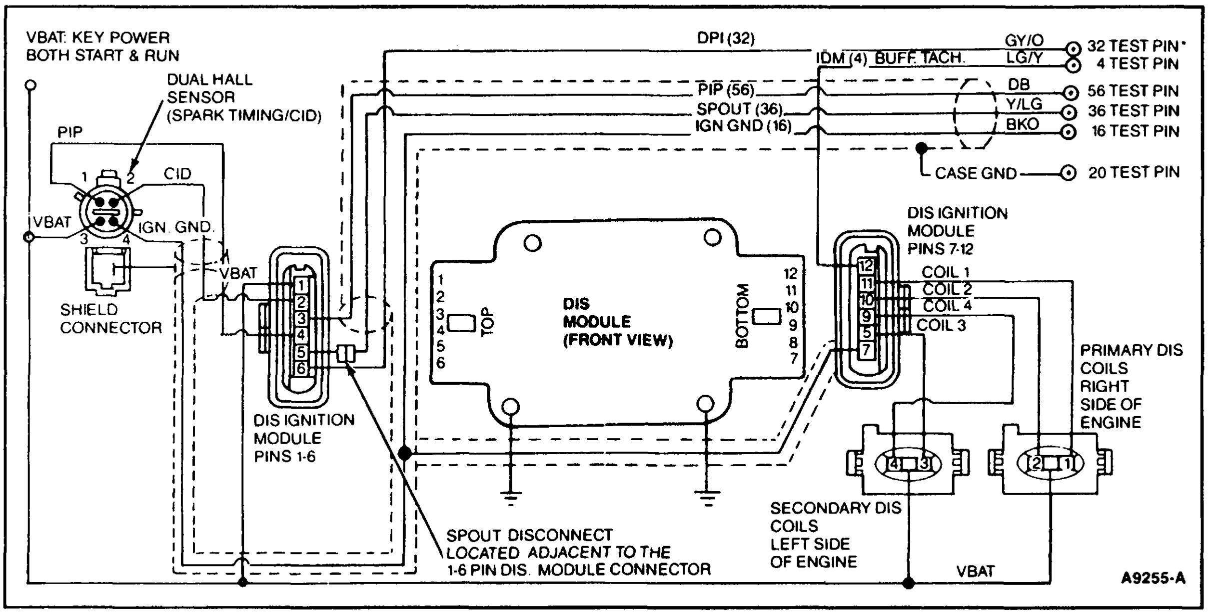
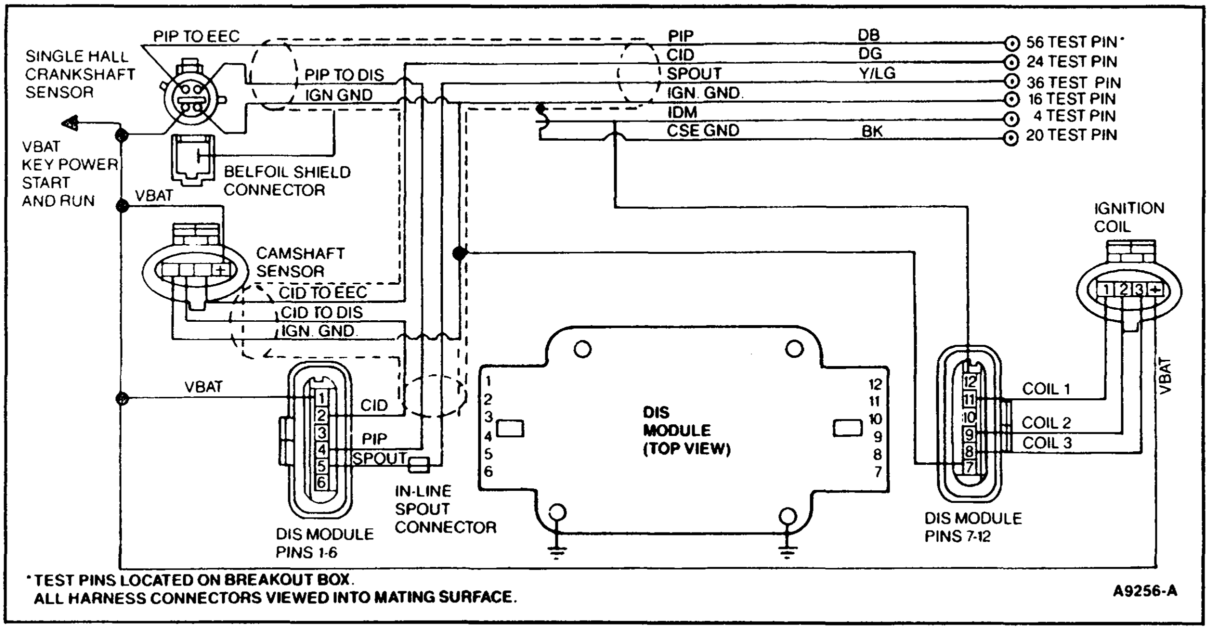
Spark Timing Check

Pinpoint Test | **P**

2.3L OHC EFI Truck



3.0L SHO SEFI MA and 3.8L SEFI SC



Test Pin 4	IDM
3.0L SHO MA	GY/O
3.8L SC MA	DG/Y

Test Pin 16	Ign. Gnd.
3.0L SHO MA	BK/O
3.8L SC MA	LB

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Spark Timing Check

Pinpoint Test **P**

TEST STEP	RESULT ▶	ACTION TO TAKE
P1 ENGINE RUNNING SERVICE CODE 18: CHECK COMPUTED SPARK TIMING		
For TFI Vehicles: Engine Running Service Code 18 indicates that the SPOUT circuit is open. Possible causes: — Open harness — Processor — TFI module For DIS Vehicles: Engine Running Service Code 18 indicates that the SPOUT circuit is either open or shorted to ground. Possible causes: — Open or shorted harness — Processor — DIS module **NOTE: Self-Test locks the timing at 20 degrees plus base during code output and for two minutes after the last service code is outputted. Timing check must be made during this time period. Self-Test timing is base +20 degrees (± 3 degrees) BTDC. (See VECI decal for base value.)** • Check timing (on 2.3L DIS truck, use exhaust side plug). Record value. • **Is computed timing equal to base plus 20 degrees (± 3 degrees)**	Yes ▶ No ▶	GO to Quick Test Step 5.0 . GO to P2 .

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Spark Timing Check

Pinpoint Test P

TEST STEP	RESULT ▶	ACTION TO TAKE
P2 CHECK BASE SPARK TIMING		
• Locate spout connector and open this connection. • Start engine. • Check base timing. • **Is base timing within ±3 degrees of value on VECI decal?**	Yes ▶	RECONNECT SPOUT connector. GO to P3 .
	No ▶	For TFI: Adjust base timing if necessary. REFER to Section 13 for engine timing instructions. After timing is reset, RECONNECT SPOUT and PERFORM Quick Test Step 4.0 . For DIS: Base timing is not adjustable. GO to Shop Manual Group 21 (Group 3 for Compact Truck).
P3 CHECK FOR POWER TO PROCESSOR		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires. Service as necessary. • Install breakout box, leave processor disconnected. • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between Test Pin 37 and Test Pin 40 and between Test Pin 57 and Test Pin 60 at the breakout box. • **Is voltage greater than 10.5 volts?**	Yes ▶	GO to P4 .
	No ▶	GO to Pinpoint Test Step B1 except 2.5L HSC CFI, 3.0L SHO, 3.0L EFI, 3.8L SC, and 3.8L AXOD EFI passenger car; GO to Pinpoint Test Step X1 .

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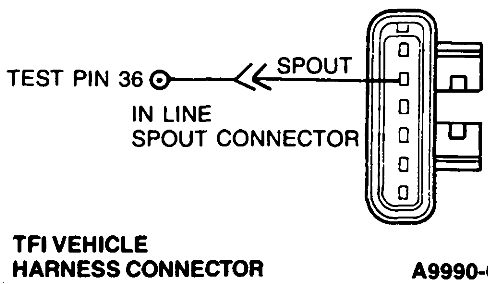
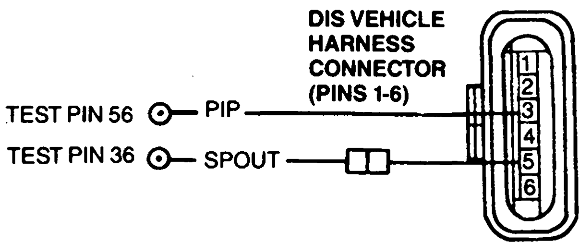
Spark Timing Check

Pinpoint Test **P**

TEST STEP	RESULT ▶	ACTION TO TAKE
P4 CHECK SPOUT CIRCUIT FOR CONTINUITY		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • Disconnect TFI or DIS module. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 36 SPOUT at the breakout box and the SPOUT pin at the TFI or DIS vehicle harness connector. • **Is resistance less than 5 ohms?**	Yes ▶	All DIS vehicles GO to P5 . All others GO to P6 .
	No ▶	SERVICE open circuit. CHECK timing per P1 .



A9990-C



A9257-A

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Spark Timing Check

Pinpoint Test P

TEST STEP	RESULT ▶	ACTION TO TAKE
P5 CHECK SPOUT FOR SHORTS		
∘ Key off, wait 10 seconds. ∘ Breakout box installed, processor disconnected. ∘ DIS disconnected. ∘ DVOM on 200,000 ohm scale. For Shorts To Ground: — Measure resistance between Test Pin 36 and Test Pins 16, 20, 40, 46 & 60. For Shorts To Power: — Measure resistance between Test Pin 36 and Test Pins 26, 37 & 57. For Short To PIP Circuit: — Measure resistance between Test Pin 36 and Test Pin 56. ∘ **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to P6 . SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
P6 EEC-IV PROCESSOR INTEGRITY		
∘ Key off, wait 10 seconds. ∘ Breakout box installed. ∘ Connect processor to breakout box. ∘ Reconnect TFI or DIS module. ∘ Timing switch to "DIST" position on breakout box. ∘ DVOM on 20 volt scale. ∘ Measure voltage between Test Pin 36 at the breakout box and negative side of battery during Engine Running Self-Test. ∘ **Is voltage between 4.0 and 10.0 volts?**	Yes ▶ No ▶	EEC system OK. REMOVE breakout box. REFER to Section 13 for TFI-IV Diagnosis. REMOVE breakout box. REPLACE processor. RERUN Quick Test.

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Spark Timing Check

Pinpoint Test P

TEST STEP	RESULT ▶	ACTION TO TAKE
P10 CONTINUOUS MEMORY CODE 49: CHECK HARNESS FOR CONTINUITY		
Service Code 49 indicates the SPOUT signal has defaulted to 10 degrees BTDC. The SPOUT signal has a variable duty cycle with amplitude that varies from 0.4 volts to VBAT. In the event of a SPOUT failure, the DIS module will generate a fixed dwell and constant spark angle based on CID and PIP signals (FMEM mode). Possible causes: — Faulty DIS module — Faulty SPOUT line from processor to DIS module • Key off, wait 10 seconds. • Breakout box installed. • Processor disconnected. • Disconnect DIS module. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 36 at the breakout box and Pin 5 at the DIS module connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to P11 . VERIFY SPOUT connector is properly connected. If OK, SERVICE open circuit. RECONNECT all components. RERUN Quick Test.
P11 CHECK SPOUT CIRCUIT FOR SHORT TO POWER AND GROUND		
• Key off, wait 10 seconds. • Breakout box installed. • EEC-IV processor and DIS module disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 36 at the breakout box and Test Pin 16, 40 and battery positive. • **Are all reistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to Section 13 for TFI or DIS diagnosis. SERVICE SPOUT circuit for SHORT to POWER, or GROUND. RECONNECT all components. RERUN Quick Test.

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No Codes/Codes Not Listed

Pinpoint Test | **QA**

Note

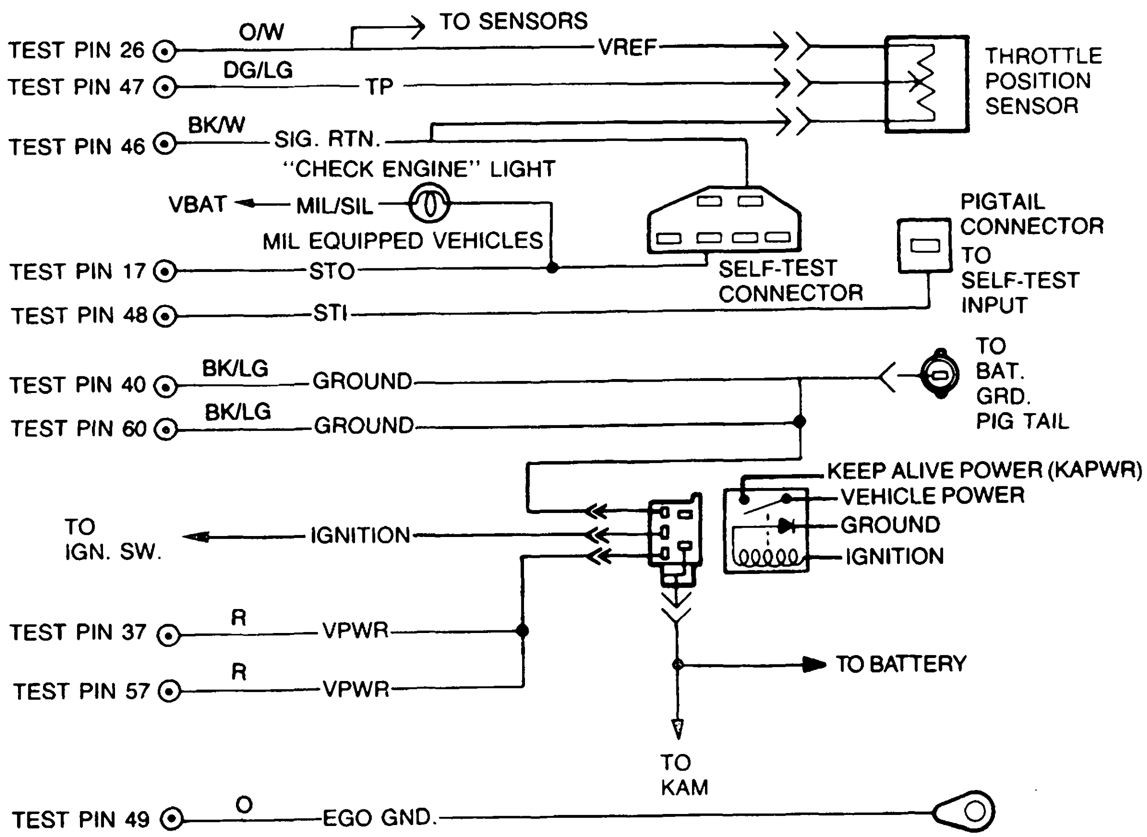
You should enter this Pinpoint Test only when directed here from Quick Test Step 3.0, 5.0 or 6.0.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Processor (-12A650-)
- EEC Power Relay (-12A646-)
- Harness Circuits: SIGNAL RETURN, STO, STI, GROUND, VPWR, VREF, NDS

Pinpoint Test Schematic



***TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9692-E

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No Codes/Codes Not Listed

Pinpoint Test QA

Test Pin 17	Self-Test Output and "Check Engine" Light
Application	**Wire Color**
5.0L SEFI Mark VII 3.8L RWD SEFI 3.8L SC SEFI	Y/BK
5.0L SEFI MA 2.3L OHC EFI	T
1.9L EFI	T/LB
4.9L EFI F-Series Bronco 5.0L EFI F-Series, Bronco 5.8L EFI F-Series, Bronco 7.3L Diesel 7.5L F-Series Bronco	PK/LG
All Others	T/R

Test Pin 48	Self-Test Input
Application	**Wire Color**
3.0L EFI 3.8L EFI AXOD 2.5L CFI CLC 2.5L CFI MTX 5.0L SEFI Crown Victoria/Grand Marquis and Town Car	W/BK
All Others	W/R

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No Codes/Codes Not Listed — Pinpoint Test QA

TEST STEP	RESULT	ACTION TO TAKE
QA1 CHECK FOR VREF		
Refer to schematic in Pinpoint Test [QA]. • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between Test Pin 26 and SIGNAL RETURN at the Self-Test connector. • **Is voltage between 4.0 and 6.0 volts?**	Yes ▶ No ▶	GO to [QA2]. GO to Pinpoint Test Step [C1].
QA2 CHECK SELF-TEST INPUT CONTINUITY		
Refer to schematic in Pinpoint Test [QA]. • Key off, wait 10 seconds. • Breakout box installed. • Disconnect processor. • Set DVOM to 200 ohm scale. • Measure resistance between SELF-TEST INPUT at the Self-Test single pin connector and Test Pin 48 at the breakout box. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to [QA3]. SERVICE open circuit. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.
QA3 CHECK SELF-TEST OUTPUT CIRCUIT CONTINUITY		
Refer to schematic in Pinpoint Test [QA]. • Breakout box installed, processor disconnected. • DVOM to 200 ohm scale. • Measure resistance between SELF-TEST OUTPUT at the Self-Test connector and Test Pin 17 at the breakout box. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to [QA4]. SERVICE open circuit. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.

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No Codes/Codes Not Listed

Pinpoint Test QA

TEST STEP	RESULT	ACTION TO TAKE
QA4 CHECK EGO SENSOR GROUND CONTINUITY		
Refer to schematic in Pinpoint Test QA . • Key off. • Breakout box installed, processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between EGO GROUND on engine and Test Pin 49 at the breakout box. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to QA5 . SERVICE open circuit. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.
QA5 STO SHORT TO GROUND		
• Key off. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between SELF-TEST OUTPUT at Self-Test connector and engine block ground. • **Is resistance less than 10,000 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT processor. SERVICE STO or MIL/SIL circuit for short to ground. RERUN Quick Test. 3.0L EFI and 3.8L AXOD passenger car GO to QA7 . All others GO to QA6 .
QA6 INTERMITTENT NDS		
• Key off. • Breakout box installed. • Connect processor. • Connect DVOM between Test Pin 30 and Test Pin 40 or 60 at the breakout box. • Run Engine Running Self-Test. • **Is voltage greater than 1 volt?** **NOTE: Refer to proper illustration in Pinpoint Test FA for connector orientation.**	Yes ▶ No ▶	SERVICE intermittent open in NDS harness, connector or switch. If OK, REMOVE breakout box. RECONNECT processor. GO to Quick Test Step 5.0 for appropriate service codes. GO to QA7 .

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No Codes/Codes Not Listed — Pinpoint Test QA

TEST STEP	RESULT	ACTION TO TAKE
QA7 POWER RELAY ALWAYS ON		
• Key off. • Breakout box installed. • Connect DVOM to Test Pin 37 or 57 and to Test Pin 40 or 60 at the breakout box. • Turn key ON and OFF. Wait 10 seconds. • **Does voltage change from greater than 10.5 volts to zero volts?**	Yes ▶	If vehicle is equipped with MIL (malfunction indicator light displayed as "CHECK ENGINE" light) or SIL (shift indicator light) GO to QA9. If not, REPLACE the processor. RERUN Quick Test.
	No ▶	GO to QA8.
QA8 VPWR HARNESS SHORT TO POWER		
• Key off. • Breakout box installed. • EEC Power Relay or Integrated Relay Controller disconnected. • Connect DVOM to Test Pin 37 or 57 and to Test Pin 40 or 60 at the breakout box. • **Is voltage greater than 10.5 volts?**	Yes ▶	SERVICE VPWR harness short to power. RERUN Quick Test.
	No ▶	REPLACE EEC Power Relay or Integrated Relay Controller. RERUN Quick Test.
QA9 MIL AND/OR SIL EQUIPPED VEHICLES		
• **Are any of these conditions present?** • Shift indicator light: — Always ON	▶	GO to KL1.
— Always OFF	▶	GO to KL1.
• Malfunction indicator light: — Always ON	▶	GO to ML1.
— Always OFF	▶	GO to ML5.
• Shift and malfunction indicator lights functioning normally	▶	REPLACE the processor. RERUN Quick Test.

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Key On Engine Off and/or Continuous Memory Service Code 15

Pinpoint Test

QB

Note

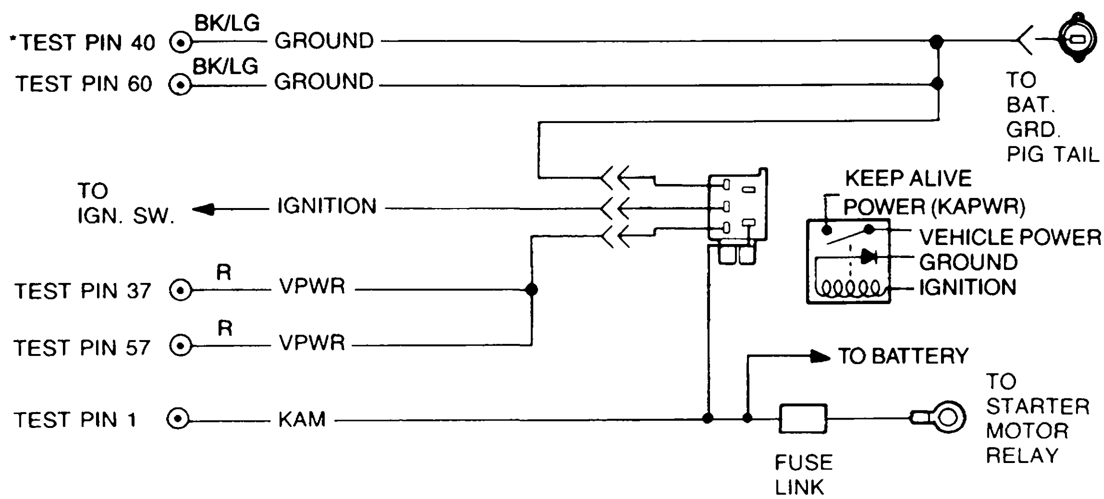
You should enter this Pinpoint Test only when directed here from Quick Test Step 3.0 or 6.0.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Processor (-12A650-)
- Harness Circuits: GROUND, VPWR, KAM, IGNITION

Pinpoint Test Schematic



***TEST PINS LOCATED ON BREAKOUT BOX**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE

A11503-B

Test Pin 1 Keep Alive Power

Application	Wire Color
2.3L OHC, EFI 5.0L SEFI Mark VII 5.0L SEFI-MA 5.0L EFI, E-Series 7.5L EFI, E-Series	BK/O
All Others	Y

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Key On Engine Off and/or Continuous Memory Service Code 15

Pinpoint Test QB

TEST STEP		RESULT ▶	ACTION TO TAKE
QB1	CONDITIONS FOR CONTINUOUS CODE 15		
NOTE: Anytime power is interrupted to the processor, for example when installing a breakout box, a Code 15 may be outputted the first time Key On Engine Off Self-Test is run after restoration of power. Rerun Self-Test to ensure correct diagnosis. o Clear Continuous Memory Codes (use procedure described in Quick Test Appendix). o Rerun Quick Test Step 3.0 through Continuous memory code output. o **Code 15 present on retest?**		Yes ▶ No ▶	GO to QB2 . SERVICE other codes as necessary. If none, testing complete.
QB2	INSPECT ENGINE COMPARTMENT WIRING FOR PROPER ROUTING		
o Inspect EEC wiring for closeness to ignition components or wires (High Electrical Energy Sources). If EEC wiring is close, reroute and rerun Key On Engine Off Self-Test. o **Is Code 15 still present in Continuous Memory?**		Yes ▶ No ▶	GO to QB3 . SERVICE other codes as necessary. If none, testing complete.
QB3	CHECK POWER CIRCUIT TO KEEP ALIVE MEMORY		
NOTE: If during initial Key On Engine Off Self-Test, no voltage to the processor is observed, a Code 15 will be generated. o Key off, wait 10 seconds. o Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o Install breakout box, leave processor disconnected. o DVOM on 20 volt scale. o Connect positive test lead to Test Pin 1 and negative test lead to Test Pin 40 or 60 at the breakout box. o Key on. o **Is voltage less than 10.5 volts?**		Yes ▶ No ▶	SERVICE open circuit. REMOVE breakout box. RECONNECT processor. RERUN Quick Test. REMOVE breakout box. REPLACE processor. RERUN Quick Test.

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Output State Check Not Functioning

Pinpoint Test QC

Note

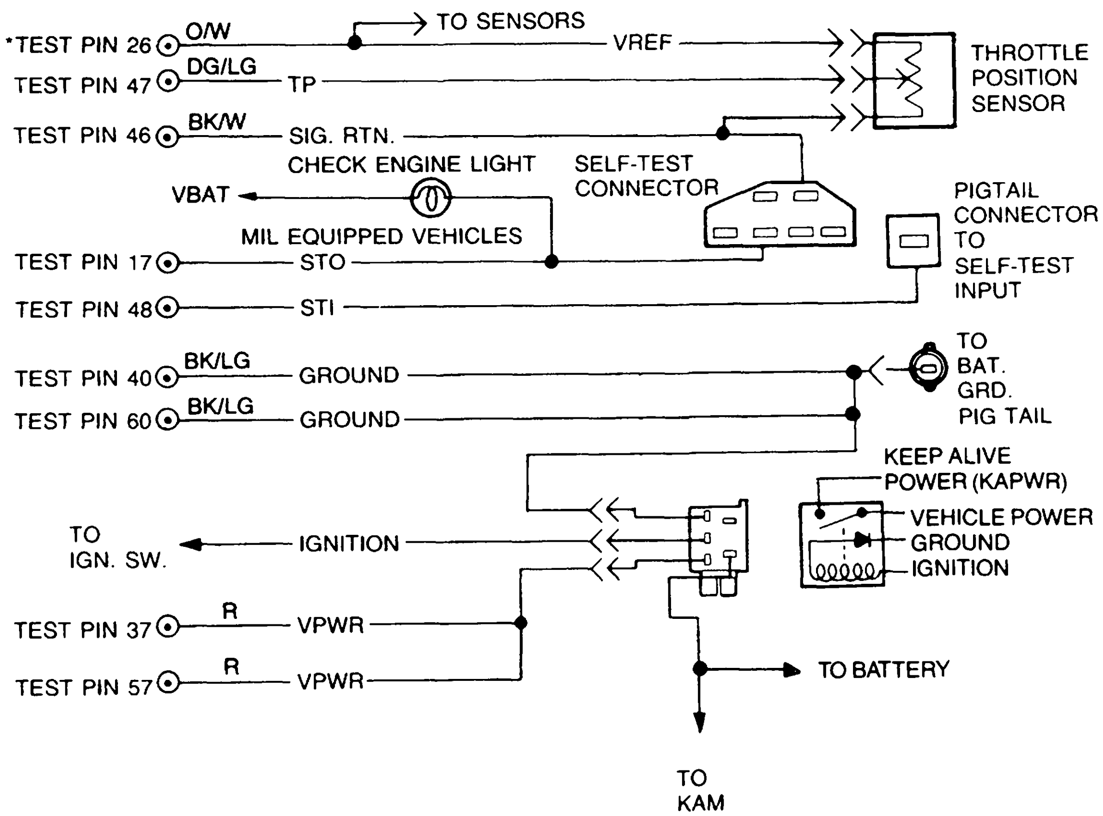
You should enter this Pinpoint Test only when directed here from other Pinpoint Tests.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Processor (-12A650-)
- Harness Circuits: SIGNAL RETURN, STO, STI, GROUND, VPWR, VREF

Pinpoint Test Schematic



***TEST PINS LOCATED ON BREAKOUT BOX**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE

A11504-B

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Output State Check Not Functioning

Pinpoint Test QC

Test Pin 17 Application	Self-Test Output and "Check Engine" Light Wire Color
5.0L SEFI Mark VII 3.8L RWD SEFI 2.3L EFI Turbo	Y/BK
5.0L SEFI-MA 2.3L OHC EFI	T
1.9L EFI	T/LB
4.9L EFI 5.0L EFI F-Series, Bronco 5.8L EFI F-Series, Bronco	PK/LG
All Others	T/R

Test Pin 48 Application	Self-Test Input Wire Color
3.0L EFI 3.8L SEFI AXOD 2.5L CFI CLC 2.5L CFI MTX 5.0L SEFI Crown Victoria/Grand Marquis and Town Car	W/BK
All Others	W/R

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Output State Check Not Functioning

Pinpoint Test QC

TEST STEP	RESULT ▶	ACTION TO TAKE
QC1 CHECK FOR CODES 23, 53, 63 OR 68		
• Key off, wait 10 seconds. • Perform Key On Engine Off Self-Test. • **Are any of these codes 23, 53, 63 or 68 present?**	Yes ▶	GO to Quick Test Step **3.0B** and SERVICE appropriate code as instructed.
	Code 11 ▶	GO to **QC2** .
	No Codes ▶	GO to **QA1** .
QC2 CHECK THROTTLE LINKAGE		
• Check throttle and throttle linkages for sticking and binding. • **Is throttle OK?**	Yes ▶	REPLACE TP sensor. RERUN Quick Test.
	No ▶	SERVICE as necessary. RERUN Quick Test.

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Re-Initialization Check

Pinpoint Test | **QD**

Note

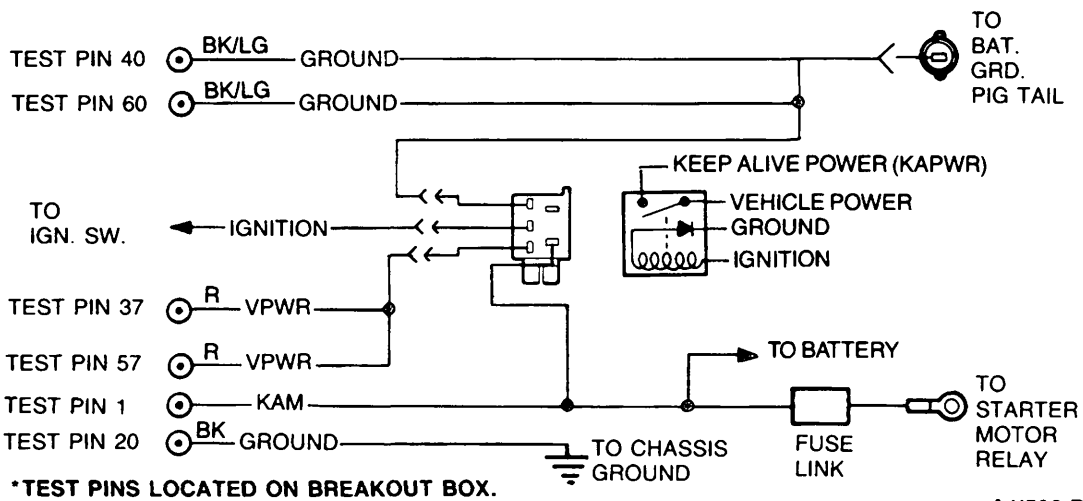
You should enter this Pinpoint Test only when at Secvice Code 71, 72, 78 is received or when directed here from Quick Test Step 6.0 or 7.0.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Processor (-12A650-)
- EEC Power Relay
- Harness Circuits: GROUND, VPWR, IGNITION

Pinpoint Test Schematic



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A11506-B

Test Pin 1	Keep Alive Power
Application	**Wire Color**
2.3L OHC EFI 5.0L SEFI Mark VII 5.0L SEFI MA Mustang 5.0L EFI Econoline 7.5L EFI Econoline	BK/O
All Others	Y

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Re-Initialization Check

Pinpoint Test **QD**

TEST STEP		RESULT ▶	ACTION TO TAKE
QD1	SERVICE CODE 71, 72 or 78: CHECK FOR SOURCES OF ELECTRICAL NOISE		
	A Continuous Memory Code 72 or 78 indicates that sometime during the last 40 warm-up cycles, power to the processor was interrupted. A Continuous Memory Code 71 indicates that sometime during the last 40 warm-up cycles the EEC-IV processor software requested re-initialization (the execution of data halted and then re-started from the beginning) which may or may not result in a drive complaint. Possible causes: — Noise into processor • Vehicle power interrupted to processor • Spark plug wires improperly routed or too close to the ignition system • The shielding surrounding the ignition wires pulled back or removed • Electrical, radio, or motor noise • Test Pin 20 (case ground) not grounded to chassis • Diodes open on A/C, ISC, relays **NOTE: Be aware that after-market installed electrical components may influence the driveability of the vehicle.** • Key off. • Check that the EEC IV wiring and components are greater than 2 inches from secondary ignition wires and ignition coil. • Check that the EEC IV wiring and components are greater than 4 inches from distributor, coil tower, starter motor and its wiring. • **Are all above conditions satisfied?**	Yes ▶ No ▶	GO to QD2 . SERVICE as necessary, RERUN Quick Test.
QD2	HARNESS CHECK — CASE GROUND		
	• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 20 at the breakout box and chassis ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to QD3 . REMOVE breakout box. RECONNECT processor. SERVICE open circuit. RERUN Quick Test.

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Re-Initialization Check

Pinpoint Test QD

TEST STEP	RESULT ▶	ACTION TO TAKE
QD3 DISCONNECT HARNESS — CASE GROUND CHECK		
• Key off. • Reconnect processor to breakout box, but disconnect harness from breakout box. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 20 at the breakout box and metal case of processor. • **Is the resistance less than 5 ohms?**	Yes ▶	For 1.9L EFI GO to QD4. For 2.5L CFI GO to X10.
	No ▶	REMOVE breakout box. REPLACE processor. RERUN Quick Test.
QD4 WIGGLE TEST OF VPWR CIRCUIT		
• Key on, engine off. • Connect STAR or VOM to Self-Test connector. • Self-Test deactivated. • Using Continuous Monitor Mode (Engine Running) per Quick Test Step 6.0B, observe STAR/VOM for indication of a fault while doing the following: — Shake, bend, and twist the EEC-IV harness from the EEC-IV power relay to the processor. • Is a fault indicated or does Code 71 reappear in Continuous Memory if the Key On Engine Off Self-Test is rerun?	Yes ▶	SERVICE intermittent in the VPWR circuit. RERUN Quick Test.
	No ▶	INSPECT EEC-IV power relay and harness connectors for damaged pins, loose wires, corrosion, etc. SERVICE as necessary. If OK, REPLACE EEC-IV power relay. RERUN Quick Test.
QD5 SERVICE CODE 19: INTERNAL VOLTAGE		
This Service Code 19 indicates the processor's voltage regulator inability to maintain proper internal voltage, which is necessary for the processor to accurately compute data. • Rerun Key On Engine Off Self-Test. • **Is 19-10-11 present?**	Yes ▶	REPLACE EEC-IV processor. RERUN Quick Test.
	No ▶	GO to Quick Test Step 3.0B. Proceed as directed.

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Key Power Check

Pinpoint Test **QE**

Note

You should enter this Pinpoint Test only when a Service Code 55 is received in Quick Test Step 5.0.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

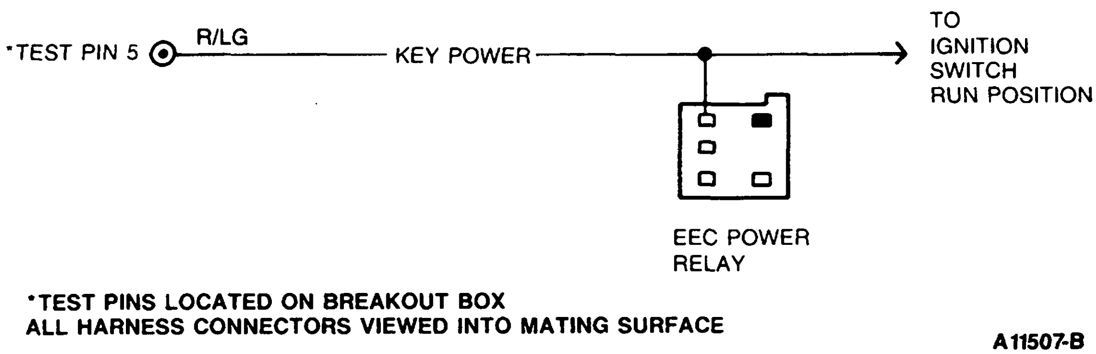
- Charging system under voltage
- Battery charger connected with engine running
- Jump starting

This Pinpoint Test is intended to diagnose only the following:

- Harness Circuit: KEY POWER
- Processor assembly (-12A650-)

Pinpoint Test Schematic

1.9L CFI



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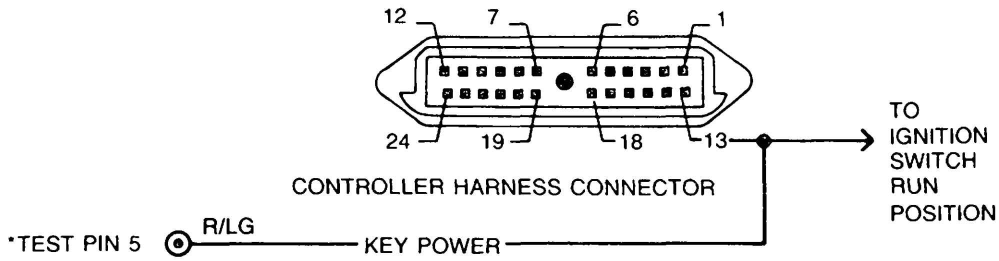
Key Power Check

Pinpoint Test QE

Pinpoint Test Schematic

2.5L CFI WITH INTEGRATED CONTROLLER



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A11508-B

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Key Power Check — Pinpoint Test QE

TEST STEP	RESULT ▶	ACTION TO TAKE
QE1 SERVICE CODE 55: CHECK CONTINUITY OF KEY POWER CIRCUIT		
Service Code 55 indicates that the key power circuit is low. Possible causes: — Circuit shorted to ground — Faulty processor • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Disconnect the EEC-IV power relay or integrated controller as appropriate. • DVOM on 200 ohm scale. For 1.9L CFI: • Measure resistance between Test Pin 5 at the breakout box and KEY POWER at the EEC power relay. For 2.5L CFI: • Measure resistance between Test Pin 5 at the breakout box and Pin 5 at the integrated controller vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to QE2 . REMOVE breakout box. RECONNECT processor and EEC power relay or integrated controller. SERVICE open circuit. RERUN Quick Test.
QE2 CHECK KEY POWER CIRCUIT FOR SHORT TO GROUND		
• Key off. • Breakout box installed, processor disconnected. • EEC power relay or integrated controller disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 5 and Test Pins 40, 46, and 60 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT EEC power relay or integrated controller. REPLACE processor. RERUN Quick Test. REMOVE breakout box. RECONNECT processor and EEC power relay or integrated controller. SERVICE short circuit. RERUN Quick Test.

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System Check

Pinpoint Test **S**

Note

You should enter this Pinpoint Test only after a Code 11 is received in Quick Test Step 3.0 or 5.0, and you have been directed here from EEC-IV No-Start Pinpoint Test Step A20 or Quick Test Step 7.0.

Remember

To prevent the replacement of good components, be aware that the following Non-EEC areas may be at fault:

- Poor power/ground connections
- Ignition system distributor cap, rotor, wires, coil, plugs
- Base engine valves, cam timing, compression, etc.

This Pinpoint Test is intended only as a Quick Check for the basic functioning of the following:

- ISC Bypass Air System
- MAP System
- EGR System
- MAF System

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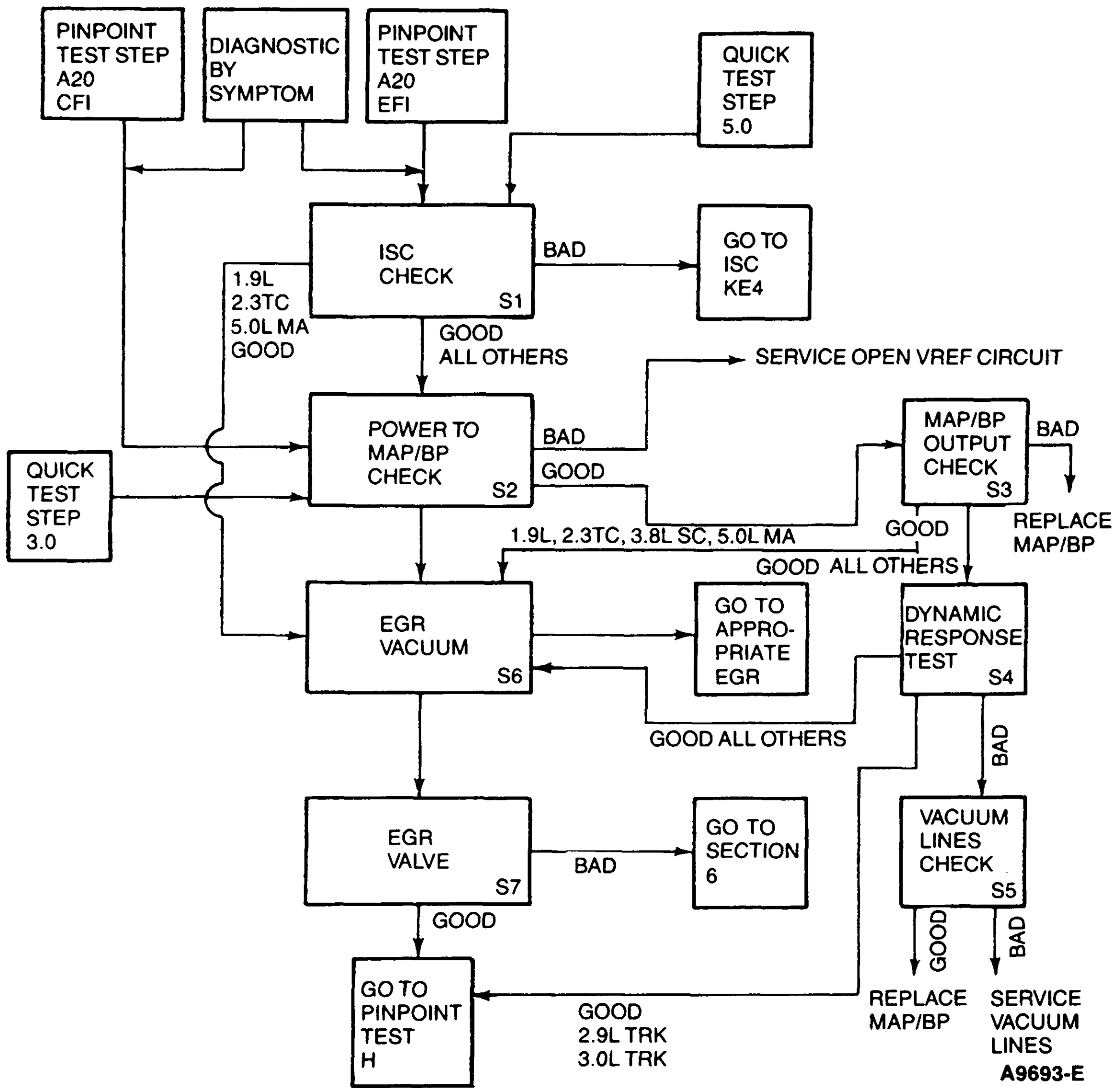
System Check

Pinpoint Test **S**

Pinpoint Test Flow Chart



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System Check

Pinpoint Test S

TEST STEP	RESULT	ACTION TO TAKE
S1 ISC-BPA CHECK		
NOTE: This Test Step is for EFI vehicles with stalls and or no starts. For CFI vehicles go directly to S2.	Yes ▶	GO to KE4.
• Attempt to start engine at part throttle.	No ▶	1.9 EFI and 2.3L EFI TC and 5.0L MA Mustang, GO to S6.
• **Will engine run smooth at part throttle?**		All others GO to S2.

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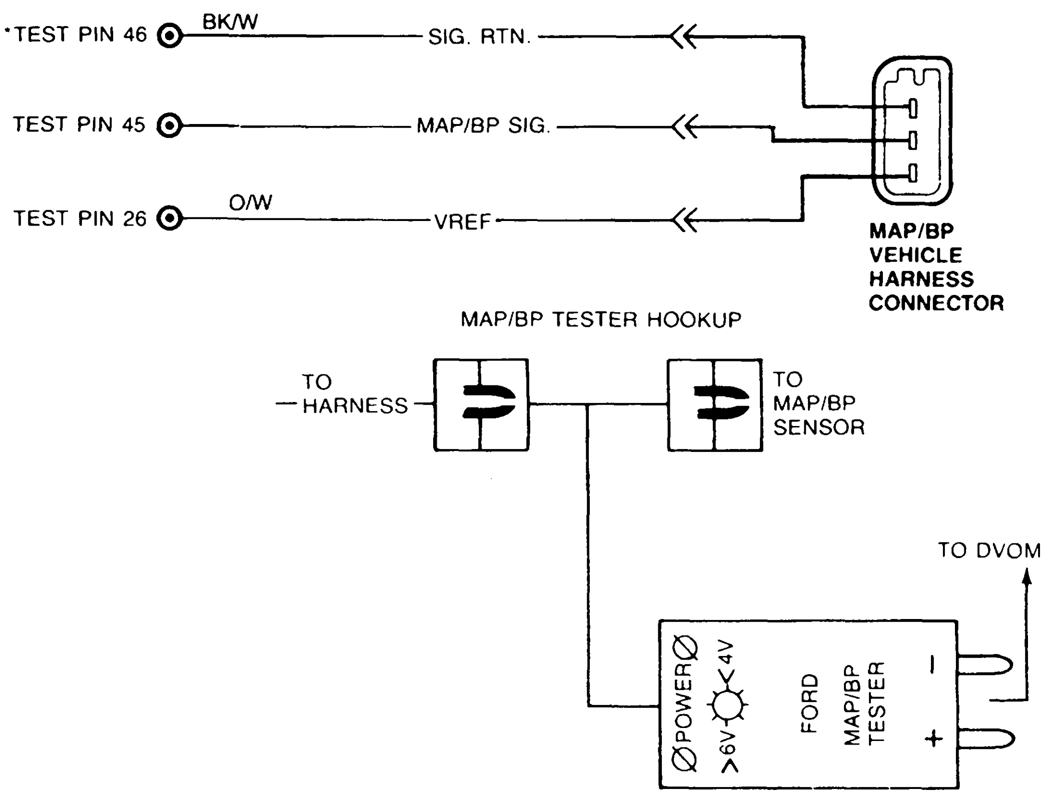
System Check

Pinpoint Test S

TEST STEP	RESULT ▶	ACTION TO TAKE
S2 POWER TO MAP/BP SENSOR TEST		
NOTE: Green light on tester indicates VREF is OK. Red light (or no light) indicates VREF is either too low or too high. • Key off. • Disconnect the MAP/BP sensor from the vehicle harness. • Connect the MAP/BP tester between the vehicle harness and the MAP/BP sensor. • Insert MAP/BP tester banana plugs into DVOM. • Set DVOM to 20 volt scale. • Refer to schematic below or schematic in Pinpoint Test DE. • MAP/BP tester connected. • Key on. • **Is green light on?**	Yes ▶ No ▶	GO to S3. SERVICE open VREF circuit. REMOVE MAP/BP tester. RECONNECT MAP/BP. RE-EVALUATE symptom.



***TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9588-C

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System Check

Pinpoint Test S

TEST STEP	RESULT ▶	ACTION TO TAKE
S3 MAP/BP TESTER OUTPUT READING		
NOTE: Measure several known good MAP sensors on available vehicles. The measured voltage will be typical for your location on the day of testing. • MAP Tester connected. • Key on. • **Approximate Altitude (Ft.) / Voltage Output (+/ − .04 Volts)** 0 — 1.59 1000 — 1.56 2000 — 1.53 3000 — 1.50 4000 — 1.47 5000 — 1.44 6000 — 1.41 7000 — 1.39 • **Is voltage in range for your altitude?**	Yes ▶	For 1.9L EFI, 2.3L EFI TC, 3.8L SC SEFI and 5.0L Mustang SEFI GO to S6. For all others, GO to S4.
	No (Sensor output is out-of-range) ▶	REPLACE MAP/BP sensor.
S4 MAP/BP ENGINE RUNNING RESPONSE TEST		
• Key on • Crank engine. • **While cranking, does MAP/BP output voltage change any amount?**	Yes ▶	2.9L EFI and 3.0L EFI Truck, GO to Pinpoint Test Step H1, all others, GO to S6.
	No ▶	GO to S5.
S5 CHECK VACUUM LINES		
• Check vacuum lines for proper routing. Refer to VECI decal. Check MAP sensor vacuum line for holes, disconnections, kinks or blockage. ○ **Are vacuum lines OK?**	Yes ▶	REMOVE MAP/BP tester. REPLACE MAP sensor. RE-EVALUATE symptom.
	No ▶	SERVICE vacuum lines as necessary. RERUN Quick Test.

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System Check

Pinpoint Test S

TEST STEP	RESULT ▶	ACTION TO TAKE
S6 CHECK EGR VACUUM		
NOTE: The next two Test Steps will attempt to determine if the EGR system is the cause of the current symptom and/or no start. • Disconnect vacuum line at EGR valve. Do not plug the vacuum line. • Start engine. • **For Drive Symptom: Is vacuum present at vacuum line?** • **For No Start: Does engine start?**	Yes ▶	For 1.9L EFI and 2.3L EFI TC, GO to KA1. For 2.3L OHC EFI Car GO to DD11. For 2.5L HSC CFI, 5.0L SEFI Car and 2.3L OHC EFI, 4.9L EFI, 5.0L EFI, 5.8L EFI, 7.5L EFI Truck GO to DN42. For 1.9L CFI, 2.3L HSC, EFI, 3.0L EFI and 3.8L SEFI Car GO to DL23.
	No ▶	GO to S7.
S7 CHECK EGR VALVE		
• Inspect EGR valve to ensure proper seating. • **Is valve fully seated (closed)?**	Yes ▶	GO to H1.
	No ▶	GO to Section 6 of this Manual for EGR valve diagnosis.

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Transmission — AXOD

Pinpoint Test **T**

Note

You should enter this Pinpoint Test only when Service Code 29, 39, 57, 59, 62, 67, 68, 69 or 89 is received in Quick Test Step 3.0, 5.0, or 6.0.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Basic AXOD transmission problems

This Pinpoint Test is intended to diagnose only the following:

- Harness Circuits: THS 4/3, THS 3/2, TTS, LUS, NPS, VSS+, VSS− and VPWR
- Vehicle Speed Sensor (-9E731-)
- Processor Assembly (-12A650-)

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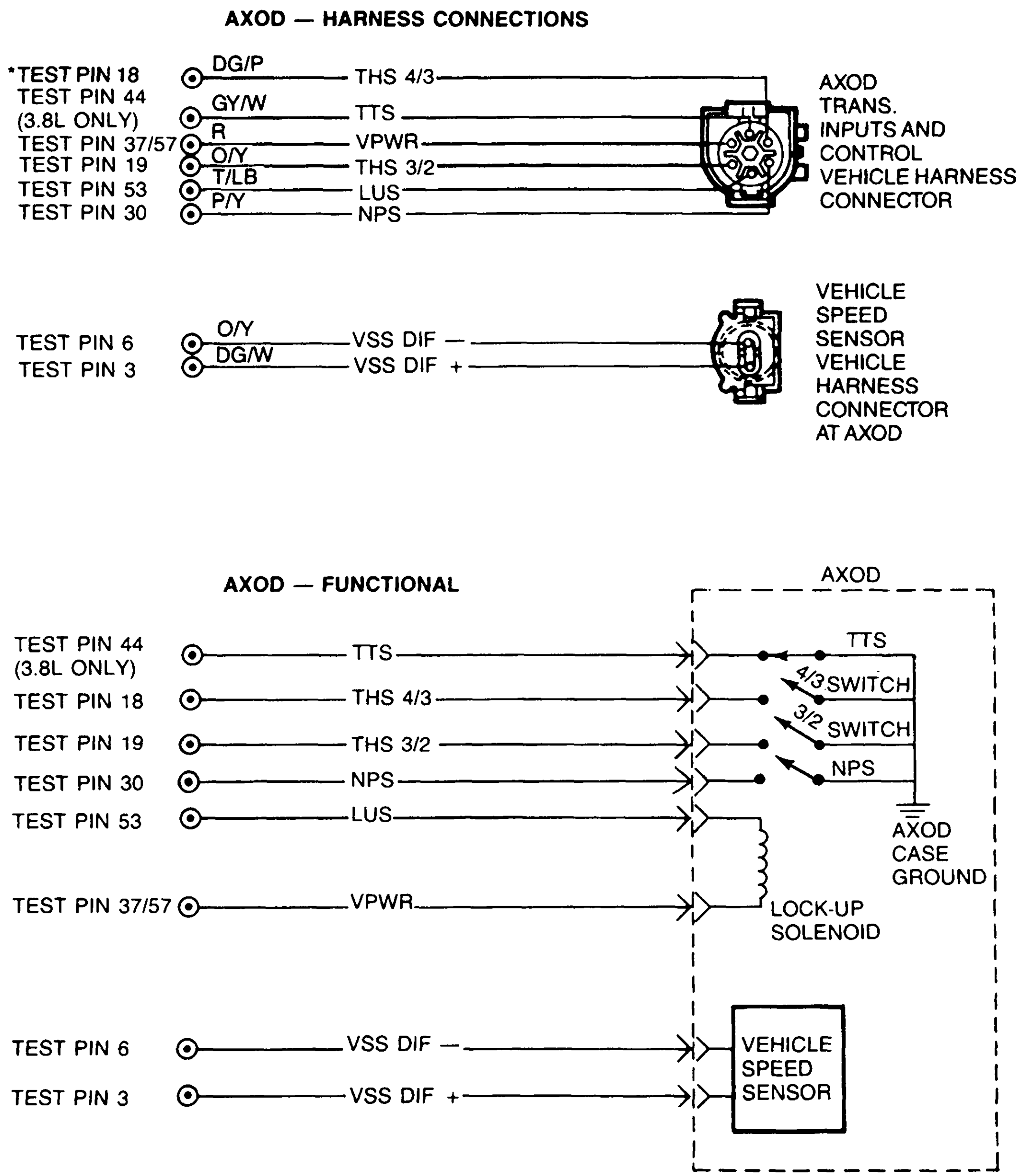
Transmission — AXOD

Pinpoint Test **T**

Pinpoint Test Schematic



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9694-D

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Transmission — AXOD

Pinpoint Test **T**

AXOD Transmission Drive Cycle

NOTE: All components must be connected when performing this test.

1. Record and clear Continuous Memory Self-Test codes.
2. Warm engine to operating temperature.
3. With transmission in D range, lightly accelerate from a stop to 40 mph to achieve third gear. Hold speed and throttle opening (not closed throttle) steady for 15 seconds minimum (30 seconds above 4000 feet altitude).
4. Shift gear selector to OD range and accelerate lightly from 40 to 50 mph to achieve fourth gear. Hold speed and throttle opening (not closed throttle) steady for 15 seconds minimum in fourth gear.
5. With transmission in fourth gear and steady speed and throttle opening (not closed throttle) lightly apply and release brakes (to light brake lamps) and then hold speed and throttle opening steady for an additional 15 seconds minimum.
6. Brake to a stop and remain stopped for 20 seconds minimum with transmission in OD range.
7. Turn engine off. Run Key On Engine Off Self-Test and record Continuous Memory Codes.

TEST STEP		RESULT ▶	ACTION TO TAKE
T1	CONTINUOUS MEMORY CODE 29: ATTEMPT TO GENERATE CONTINUOUS MEMORY CODE 29		
	Continuous Memory Code 29 indicates that there is insufficient input to the processor from the Vehicle Speed Sensor. Possible causes are: — Faulty Vehicle Speed Sensor — Open or shorted circuit — Faulty processor • Perform AXOD Transmission Drive Cycle, then return to this Step. • **Did Continuous Memory Code 29 repeat?**	Yes ▶	GO to T2 .
		No ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.

* Can be purchased as a separate item.

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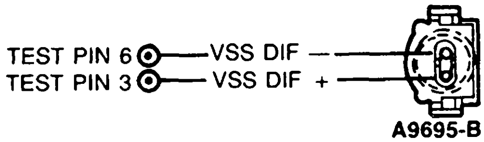
Transmission — AXOD

Pinpoint Test T

TEST STEP	RESULT ▶	ACTION TO TAKE
T2 CHECK CONTINUITY OF VEHICLE SPEED SENSOR (VSS) HARNESS		
• Key off, wait 10 seconds. • Disconnect VSS. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 3 at the breakout box and the VSS vehicle harness connector as shown below. • Measure resistance between Test Pin 6 at the breakout box and the VSS vehicle harness connector, as shown below.  • **Are both resistances less than 5 ohms?**	Yes ▶ No ▶	GO to [T3]. REMOVE breakout box. RECONNECT all components. SERVICE open circuit(s). REPEAT Test Step [T1].
T3 CHECK VSS HARNESS FOR SHORTS TO POWER OR GROUND		
• Key off. • Processor disconnected. • VSS disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 3 and Test Pins 37, 40 and 6 at the breakout box. • Measure resistance between Test Pin 6 and Test Pin 37 at the breakout box. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT all components. GO to [T4]. REMOVE breakout box. RECONNECT all components. SERVICE short circuit(s). REPEAT Test Step [T1].
T4 REPEAT DRIVE CYCLE WITH A KNOWN GOOD VSS INSTALLED		
• Substitute VSS with known good sensor. • Processor and VSS connected. • Perform AXOD Transmission Drive Cycle, then return to this Step. • **Did Continuous Memory Code 29 repeat?**	Yes ▶ No ▶	REPLACE processor. REPEAT Test Step [T1]. REPLACE VSS. RERUN Quick Test.

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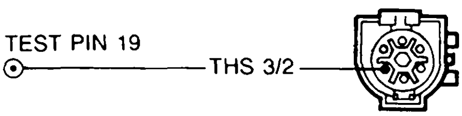
Transmission — AXOD

Pinpoint Test **T**

TEST STEP	RESULT ▶	ACTION TO TAKE
T10 CONTINUOUS MEMORY CODE 69: ATTEMPT TO GENERATE CODE 69		
Continuous Memory Code 69 indicates that the AXOD Transmission 3/2 pressure switch circuit failed open. Possible causes are: — Open or short in THS 3/2 circuit — Faulty processor — AXOD THS 3/2 pressure switch problem o Perform AXOD Transmission Drive Cycle outlined at the beginning of Pinpoint Test T, then return to this Step. o **Did Continuous Memory Code 69 repeat?**	Yes ▶	GO to T11 .
	No ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.
T11 CHECK CONTINUITY OF THS 3/2 CIRCUIT		
o Key off, wait 10 seconds. o Disconnect AXOD harness. o Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o Install breakout box, leave processor disconnected. o DVOM on 200 ohm scale. o Measure resistance between Test Pin 19 at the breakout box and the AXOD vehicle harness connector, as shown below. o **Is resistance less than 5 ohms?**  A9696-C	Yes ▶	GO to T12 .
	No ▶	REMOVE breakout box. RECONNECT all components. SERVICE open in THS 3/2 circuit. REPEAT Test Step T10 .

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Transmission — AXOD

Pinpoint Test T

TEST STEP	RESULT ▶	ACTION TO TAKE
T12 CHECK THS 3/2 CIRCUIT FOR SHORT TO POWER		
• Key off. • Breakout box installed, processor disconnected. • AXOD harness disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 19 and Test Pin 37 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to T13 . REMOVE breakout box. RECONNECT all components. SERVICE short to power in THS 3/2 circuit. REPEAT Test Step T10 .
T13 PROCESSOR VERIFICATION		
• Key off. • Breakout box installed. • Connect processor to breakout box. • Reconnect AXOD harness. • Jumper Test Pin 19 to Test Pin 40 at the breakout box. • Run Key On Engine Off Self-Test. • **Is Code 62 or 69 present?**	Yes ▶ No ▶	REMOVE breakout box. REMOVE jumper wire. GO to Taurus/Sable or Continental Shop Manual, Section 17-15 for AXOD Transmission Electrical Component Diagnostics. REMOVE breakout box. REMOVE jumper wire. REPLACE processor. REPEAT Test Step T10 .
T20 CONTINUOUS MEMORY CODE 59: ATTEMPT TO GENERATE CODE 59		
Continuous Memory Code 59 indicates that the AXOD transmission 4/3 pressure switch circuit failed open. Possible causes are: — Open or short in THS 4/3 circuit — Faulty processor — AXOD THS 4/3 pressure switch problem • Perform AXOD Transmission Drive Cycle outlined at beginning of Pinpoint Test T, then return to this Step. • **Did Continuous Memory Code 59 repeat?**	Yes ▶ No ▶	GO to T21 . Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.

* Can be purchased as a separate item.

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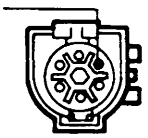
Transmission — AXOD

Pinpoint Test **T**

TEST STEP	RESULT ▶	ACTION TO TAKE
T21 CHECK CONTINUITY OF THS 4/3 CIRCUIT		
o Key off, wait 10 seconds. o Disconnect AXOD harness. o Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o Install breakout box, leave processor disconnected. o DVOM on 200 ohm scale. o Measure resistance between Test Pin 18 at the breakout box and the AXOD vehicle harness connector, as shown below. TEST PIN 18 ⊙——— THS 4/3 ———  A9697-B o **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to T22. REMOVE breakout box. RECONNECT all components. SERVICE open in THS 4/3 circuit. REPEAT Test Step T20.
T22 CHECK THS 4/3 CIRCUIT FOR SHORT TO POWER		
o Key off. o Breakout box installed, processor disconnected. o AXOD harness disconnected. o DVOM on 200,000 ohm scale. o Measure resistance between Test Pin 18 and Test Pin 37 at the breakout box. o **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to T23. REMOVE breakout box. RECONNECT all components. SERVICE short to power in THS 4/3 circuit. REPEAT Test Step T20.

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Transmission — AXOD

Pinpoint Test **T**

TEST STEP	RESULT ▶	ACTION TO TAKE
T23 PROCESSOR VERIFICATION		
• Key Off. • Breakout box installed. • Connect processor to breakout box. • Reconnect AXOD harness. • Jumper Test Pin 18 to Test Pin 40 at the breakout box. • Run Key On Engine Off Self-Test. • **Is Code 62 or 59 present?**	Yes ▶	REMOVE breakout box. REMOVE jumper wire. GO to Taurus/Sable or Continental Shop Manual, Section 17-15 for AXOD Transmission Electrical Component Diagnostics.
	No ▶	REMOVE breakout box. REMOVE jumper wire. REPLACE processor. REPEAT Test Step T20 .
T30 CONTINUOUS MEMORY CODE 39: ATTEMPT TO GENERATE CODE 39		
Continuous Memory Code 39 indicates that the AXOD transmission converter bypass clutch (lock-up) is not applying properly. **NOTE: If Continuous Memory Code 59 is also present, go directly to T20 .** • Perform AXOD Transmission Drive Cycle outlined at the beginning of Pinpoint Test T, then return to this Step. • **Did Continuous Memory Code 39 repeat?**	Yes ▶	GO to Taurus/Sable or Continental Shop Manual, Section 17-15 for AXOD Transmission Electrical Component Diagnostics.
	No ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.

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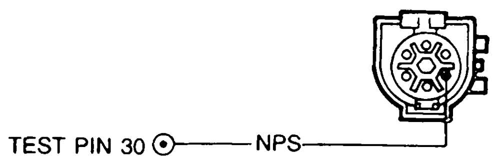
Transmission — AXOD

Pinpoint Test | **T**

TEST STEP	RESULT ▶	ACTION TO TAKE
T40 CONTINUOUS MEMORY CODE 57: ATTEMPT TO GENERATE CODE 57		
Continuous Memory Code 57 indicates that the AXOD transmission Neutral Pressure Switch (NPS) has failed open. Possible causes are: — Open or short in NPS circuit — Faulty processor — AXOD NPS problem ○ Perform AXOD Transmission Drive Cycle outlined at the beginning of Pinpoint Test T, then return to this Step. ○ **Did Continuous Memory Code 57 repeat?**	Yes ▶ No ▶	GO to T41. Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor Box: Intermittent Fault Diagnostics supplement, Section 18*. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.
T41 CHECK CONTINUITY OF NPS CIRCUIT		
○ Key off, wait 10 seconds. ○ Disconnect AXOD harness. ○ Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. ○ Install breakout box, leave processor disconnected. ○ DVOM on 200 ohm scale. ○ Measure resistance between Test Pin 30 at the breakout box and the AXOD vehicle harness connector, as shown below.  A9698-B ○ **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to T42. REMOVE breakout box. RECONNECT all components. SERVICE open in NPS circuit. REPEAT Test Step T40.

* Can be purchased as a separate item.

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Transmission — AXOD

Pinpoint Test | **T**

TEST STEP	RESULT ▶	ACTION TO TAKE
T42 CHECK NPS CIRCUIT FOR SHORT TO POWER		
• Key off. • Breakout box installed, processor disconnected. • AXOD harness disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 30 and Test Pin 37 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to T43 . REMOVE breakout box. RECONNECT all components. SERVICE short to power in NPS circuit. REPEAT Test Step T40 .
T43 PROCESSOR VERIFICATION		
• Key Off. • Breakout box installed. • Connnect processor to breakout box. • Reconnect AXOD harness. • Jumper Test Pin 30 to Test Pin 40 at the breakout box. • Run Key On Engine Off Self-Test. • **Is Code 67 present?**	Yes ▶ No ▶	REMOVE breakout box. REMOVE jumper wire. GO to Taurus/Sable or Continental Shop Manual, Section 17-15 for AXOD Transmission Electrical Component Diagnostics. REMOVE breakout box. REMOVE jumper wire. REPLACE processor. REPEAT TEST Step T40 .

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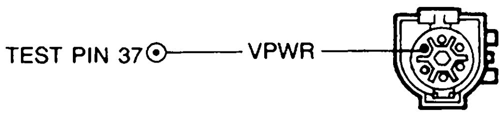
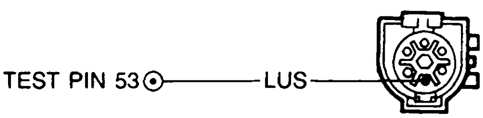
Transmission — AXOD

Pinpoint Test **T**

<table>
<tr><th colspan="2">TEST STEP</th><th>RESULT ▶</th><th>ACTION TO TAKE</th></tr>
<tr><td>T50</td><td>SERVICE CODE 89:
CHECK CONTINUITY OF VPWR CIRCUIT</td><td></td><td></td></tr>
<tr><td colspan="2">Service Code 89 indicates that the AXOD transmission Lock-Up Solenoid (LUS) circuit failed - always open or always closed.
Possible causes are:
— Open or shorted circuit
— Faulty processor
— AXOD LUS problem
∘ Key off, wait 10 seconds.
∘ Disconnect AXOD harness.
∘ Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires etc. Service as necessary.
∘ Install breakout box, leave processor disconnected.
∘ DVOM on 200 ohm scale.
∘ Measure resistance between Test Pin 37 at the breakout box and the AXOD vehicle harness connector, as shown.


A9699-C
∘ Is resistance less than 5 ohms?</td><td>Yes ▶

No ▶</td><td>GO to [T51].

REMOVE breakout box. RECONNECT all components. SERVICE open in VPWR circuit to AXOD. RERUN Quick Test.</td></tr>
<tr><td>T51</td><td>CHECK CONTINUITY OF LUS CIRCUIT</td><td></td><td></td></tr>
<tr><td colspan="2">∘ Key off.
∘ Breakout box installed, processor disconnected.
∘ AXOD harness disconnected.
∘ DVOM on 200 ohm scale.
∘ Measure resistance between Test Pin 53 at the breakout box and the AXOD vehicle harness connector, as shown.


A9700-C
∘ Is resistance less than 5 ohms?</td><td>Yes ▶

No ▶</td><td>GO to [T52].

REMOVE breakout box. RECONNECT all components. SERVICE open in LUS circuit to AXOD. RERUN Quick Test.</td></tr>
</table>

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Transmission — AXOD

Pinpoint Test | **T**

TEST STEP		RESULT ▶	ACTION TO TAKE
T52	CHECK LUS CIRCUIT FOR SHORT TO POWER OR GROUND		
	• Key off. • Breakout box installed, processor disconnected. • AXOD harness disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 53 and Test Pins 37 and 40 at the breakout box. • **Are both resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to [T53]. REMOVE breakout box. RECONNECT all components. SERVICE short(s) in LUS circuit. RERUN Quick Test. If code 89 is still present, REPLACE processor. RERUN Quick Test.
T53	CHECK TOTAL CIRCUIT RESISTANCE		
	• Key off. • Breakout box installed, processor disconnected. • Reconnect AXOD harness. • DVOM on 200 ohm scale. • Measure the resistance between Test Pin 53 and Test Pin 57 at the breakout box. • **Is resistance between 20 ohms and 40 ohms?**	Yes ▶ No ▶	REMOVE breakout box. REPLACE processor. RERUN Quick Test. REMOVE breakout box. RECONNECT processor. GO to Taurus/Sable or Continental Shop Manual, Section 17-15 for AXOD Transmission Electrical Component Diagnostics.
T60	SERVICE CODE 62: AXOD HARNESS VERIFICATION		
	Service Code 62 indicates that the AXOD transmission 4/3 or 3/2 pressure switch circuit failed closed. Possible causes are: — Short in THS 4/3 or THS 3/2 circuit. — Faulty processor — AXOD THS 4/3 or THS 3/2 pressure switch problem • Key off. • Disconnect AXOD harness. • Run Key On Engine Off Self-Test. • **Is Code 62 still present?**	Yes ▶ No ▶	GO to [T61]. RECONNECT AXOD harness. GO to Taurus/Sable Shop Manual, Section 17-15 for AXOD Transmission Electrical Component Diagnostics.

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Transmission — AXOD

Pinpoint Test | **T**

TEST STEP		RESULT ▶	ACTION TO TAKE
T61	CHECK THS 3/2 AND 4/3 CIRCUITS FOR SHORT TO GROUND		
	∘ Key off. ∘ Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. ∘ Install breakout box, leave processor disconnected. ∘ AXOD harness disconnected. ∘ DVOM on 200,000 ohm scale. ∘ Measure resistance between Test Pin 18 and Test Pins 40 and 60 at the breakout box. ∘ Measure resistance between Test Pin 19 and Test Pins 40 and 60 at the breakout box. ∘ **Are all resistances greater than 10,000 ohms?**	Yes ▶	REMOVE breakout box. RECONNECT all components. REPLACE processor. RERUN Quick Test.
		No ▶	REMOVE breakout box. RECONNECT all components. SERVICE short(s) to ground. RERUN Quick Test.
T70	SERVICE CODE 59: AXOD HARNESS VERIFICATION		
	Service Code 59 indicates that the AXOD transmission 4/3 pressure switch circuit failed closed. Possible causes are: — Short in THS 4/3 circuit — Faulty processor — AXOD THS 4/3 pressure switch problem ∘ Key off. ∘ Disconnect AXOD harness. ∘ Run Key On Engine Off Self-Test. ∘ **Is Code 59 still present?**	Yes ▶	GO to **T71**.
		No ▶	RECONNECT AXOD harness. GO to Continental Shop Manual, Section 17-15 for AXOD Transmission Electrical Component Diagnostics.
T71	CHECK THS 4/3 CIRCUIT FOR SHORT TO GROUND		
	∘ Key Off. ∘ Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. ∘ Install breakout box, leave processor disconnected. ∘ AXOD harness disconnected. ∘ DVOM on 200,000 ohm scale. ∘ Measure resistance between Test Pin 18 and Test Pins 40 and 60 at the breakout box. ∘ **Are resistances greater than 10,000 ohms?**	Yes ▶	REMOVE breakout box. RECONNECT AXOD harness. REPLACE processor. RERUN Quick Test.
		No ▶	REMOVE breakout box. RECONNECT AXOD harness and processor. SERVICE short to ground. RERUN Quick Test.

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Transmission — AXOD

Pinpoint Test T

TEST STEP	RESULT ▶	ACTION TO TAKE
T75 SERVICE CODE 69: AXOD HARNESS VERIFICATION		
Service Code 69 indicates that the AXOD transmission 3/2 pressure switch circuit failed closed. Possible causes are: — Short in THS 3/2 circuit — Faulty processor — AXOD THS 3/2 pressure switch problem • Key off. • Disconnect AXOD harness. • Run Key On Engine Off Self-Test. • **Is Code 69 still present?**	Yes ▶ No ▶	GO to [T76]. RECONNECT AXOD harness. GO to Continental Shop Manual, Section 17-15 for AXOD Transmission Electrical Component Diagnostics.
T76 CHECK THS 3/2 CIRCUIT FOR SHORT TO GROUND		
• Key Off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • AXOD harness disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 19 and Test Pins 40 and 60 at the breakout box. • **Are resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT AXOD harness. REPLACE processor. RERUN Quick Test. REMOVE breakout box. RECONNECT AXOD harness and processor. SERVICE short to ground. RERUN Quick Test.

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Transmission — AXOD

Pinpoint Test **T**

TEST STEP	RESULT ▶	ACTION TO TAKE
T80 SERVICE CODE 67: CHECK VOLTAGE AT NPS INPUT TO PROCESSOR		
Service Code 67 indicates that either the AXOD transmission Neutral Pressure Switch (NPS) circuit failed closed, or the input to the A/C clutch circuit is closed. Possible causes are: — Short in NPS circuit — Short in A/C clutch circuit (3.0L EFI only) — A/C on during Self-Test (3.0L EFI only) — Faulty processor — AXOD NPS problem o Key on, engine off. o Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires etc. Service as necessary. o Install breakout box and connect processor to breakout box. o DVOM on 20 volt scale. o Measure voltage between Test Pin 30 and Test Pin 46 at the breakout box. o **Is voltage less than 4 volts?**	Yes ▶ No ▶	GO to T81. GO to Pinpoint Test FA9.
T81 CHECK NPS HARNESS CIRCUIT FOR SHORT TO GROUND		
o Key off. o Breakout box installed. o Disconnect processor. o Disconnect AXOD harness. o DVOM on 200,000 ohm scale. o Measure resistance between Test Pin 30 and Test Pins 40 and 60 at the breakout box. o **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to T82. REMOVE breakout box. RECONNECT all components. SERVICE short to ground in NPS circuit. RERUN Quick Test.

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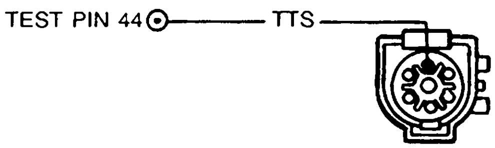
Transmission — AXOD | Pinpoint Test | T

TEST STEP	RESULT ▶	ACTION TO TAKE
T82 PROCESSOR VERIFICATION		
• Key off. • Breakout box installed. • Reconnect processor. • AXOD harness disconnected. • Run Key On Engine Off Self-Test. • **Is Code 67 present?**	Yes ▶	REMOVE breakout box. RECONNECT all components. REPLACE processor. RERUN Quick Test.
	No ▶	REMOVE breakout box. RECONNECT all components. GO to Taurus/Sable or Continental Shop Manual, Section 17-15 for AXOD Transmission Electrical Component Diagnostics.
T90 SERVICE CODE 68: CHECK CONTINUITY OF TTS CIRCUIT		
Service Code 68 indicates that the AXOD Transmission Temperature Switch (TTS) failed open. Possible causes are: — Open or short in TTS circuit — Faulty processor — AXOD TTS problem • Key off, wait 10 seconds. • Disconnect AXOD harness. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 44 at the breakout box and the AXOD vehicle harness connector, as shown below. • **Is resistance less than 5 ohms?**  A11542-A	Yes ▶	GO to T91.
	No ▶	SERVICE open in TTS circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Transmission — AXOD

Pinpoint Test **T**

TEST STEP	RESULT ▶	ACTION TO TAKE
T91 CHECK TTS CIRCUIT FOR SHORT TO POWER OR GROUND		
• Key off. • Breakout box installed, processor disconnected. • AXOD harness disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 44 and Test Pin 37 at the breakout box. • Measure resistance between Test Pin 44 and Test Pin 40 at the breakout box. • **Are resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to T92 . SERVICE short(s) in TTS circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
T92 PROCESSOR VERIFICATION		
• Key off. • Breakout box installed. • Reconnect processor and AXOD harness. • Jumper Test Pin 44 to Test Pin 40 at the breakout box. • Run Quick Test. • **Is Code 68 still present?**	Yes ▶ No ▶	REMOVE breakout box. REMOVE jumper wire. GO to Taurus/Sable or Continental Shop Manual, Section 17-15 for AXOD Transmission Electrical Component Diagnostics. REMOVE breakout box. REMOVE jumper wire. REPLACE processor. RERUN Quick Test.

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Transmission — A4LD | Pinpoint Test | TB

Note

You should enter this Pinpoint Test only when a Service Code 86 or 89 is received in Quick Test Step 3.0.

Remember

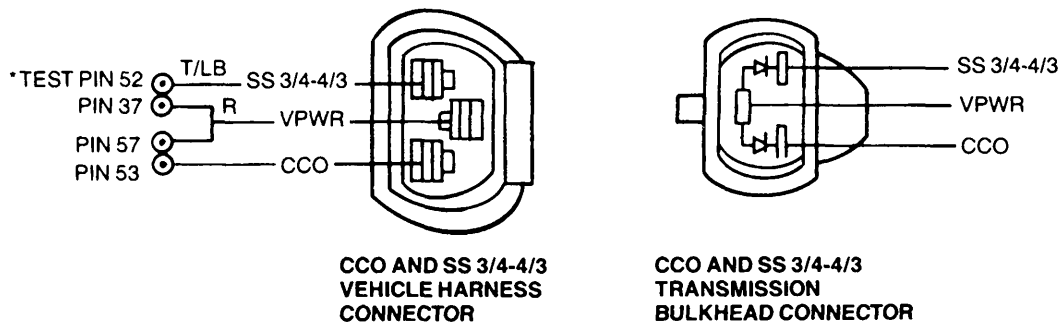
To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Hydraulic brakes
- Emergency brakes
- Internal transmission
- Transmission linkage

This Pinpoint Test is intended to diagnose only the following:

- Harness Circuits: CCO SS 3/4-4/3 and VPWR.
- CCO Solenoid (-6916-).
- Shift Solenoid 3/4-4/3 (-6916-).
- Processor Assembly (-12A650-).

Pinpoint Test Schematic



NOTE: SS 3/4-4/3 IS NOT USED ON 2.3L OHC MUSTANG

*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9202-A

Test Pin 53 — CCO Solenoid

Application	Wire Color
Car: 2.3L OHC	O/Y
Truck: 2.3L, 2.9L, 3.0L	W

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Transmission — A4LD

Pinpoint Test TB

<table>
<tr><th colspan="2">TEST STEP</th><th>RESULT ▶</th><th>ACTION TO TAKE</th></tr>
<tr><td>TB1</td><td>SERVICE CODE 86 or 89:
CIRCUIT IDENTIFICATION</td><td></td><td></td></tr>
<tr><td colspan="2">Service Code 86 indicates the processor did not see a voltage drop when the SS solenoid was activated.
Possible causes are:
— SS resistance out of limits
— SS circuit open or grounded
— Faulty processor
Service Code 89 indicates the processor did not see a voltage drop when the CCO solenoid was activated.
Possible causes are:
o CCO resistance out of limits.
o CCO circuit open or grounded.
o Faulty processor.
o Enter this Test Step for Key On Engine Off Self-Test codes.
o Verify Self-Test code match with appropriate transmission solenoid circuit below:
<table><tr><th>Solenoid</th><th>Processor Signal Output Pin</th><th>KOEO Self-Test Code</th></tr><tr><td>CCO</td><td>53</td><td>89</td></tr><tr><td>SS 3/4</td><td>52</td><td>86</td></tr><tr><td colspan="3">CCO - Converter Clutch Override
SS 3/4 Shift Solenoid 3/4-4/3</td></tr></table>
o Are any of the above codes present?</td><td>Yes ▶

No ▶</td><td>GO to TB2.

GO to Quick Test Step 3.0 for appropriate direction on any other codes.</td></tr>
<tr><td>TB2</td><td>CHECK RESISTANCE OF A4LD TRANSMISSION SOLENOID</td><td></td><td></td></tr>
<tr><td colspan="2">o Key off, wait 10 seconds.
o Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary.
o Install breakout box, leave processor disconnected.
o DVOM on 200 ohm scale.
o Measure the resistance between Test Pin 37/57 and processor signal output pin (refer to table in TB1) at the breakout box.
o Is the resistance within specification per the chart between 26 and 40 ohm?</td><td>Yes ▶

No ▶</td><td>GO to TB5.

GO to TB3.</td></tr>
</table>

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Transmission — A4LD

Pinpoint Test **TB**

TEST STEP	RESULT ▶	ACTION TO TAKE
TB3 CHECK CONTINUITY OF A4LD TRANSMISSION SOLENOID HARNESS		
• Key off. • Breakout box installed, processor disconnected. • Transmission bulkhead connector disconnected (A4LD solenoids). • DVOM on 200 ohm scale. • Measure the resistance between Test Pins 37/57 at the breakout box and that same circuit at the vehicle harness connector at the transmission. • Measure the resistance between the processor signal output pin (refer to table in TB1) at the breakout box and the same circuit at the vehicle harness connector at the transmission. • **Are the resistances less than 5 ohms?**	Yes ▶ No ▶	GO to TB4. REMOVE breakout box. SERVICE open circuit. RECONNECT processor and solenoid(s). RERUN Quick Test.
TB4 CHECK FOR SHORTS TO POWER OR GROUND OF A4LD SOLENOID HARNESS		
• Key off. • Breakout box installed, processor disconnected. • Transmission bulkhead connector disconnected. • DVOM on 200,000 ohm scale. • Measure the resistance between the processor signal output pin (refer to table in TB1) and Test Pins 37/57 at the breakout box. • Measure the resistance between the processor signal output pin (refer to table in TB1) and Test Pins 40, 60 and 46 at the breakout box and chassis ground. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to TB5. SERVICE short circuit(s). REMOVE breakout box. RECONNECT processor and solenoid(s). RERUN Quick Test.
TB5 CHECK VPWR VOLTAGE TO A4LD TRANSMISSION SOLENOIDS		
• Key off. • Breakout box installed. • Connect processor to breakout box. • Transmission bulkhead connector disconnected. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between Test Pins 37/57 at the vehicle harness connector and chassis ground/battery ground. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to Car Shop Manual, Group 17 (Group 7 for Compact Truck) for A4LD transmission service. REPLACE processor. REMOVE Breakout box. RECONNECT solenoid(s). RERUN Quick Test.

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Transmission — E4OD

Pinpoint Test | **TC**

Note

You should enter this Pinpoint Test only when Service Codes 26, 47, 56, 66, 67, 91, 92, 93, 94, 97, 98 and 99 are received in Quick Test Step 3.0 and/or Service Codes 26 and 65 are received in Quick Test Step 5.0 and/or Service Codes 29, 49, 56, 59, 62, 66, 69 and 99 are received in Quick Test Step 6.0 or when directed here from Quick Test Step 7.0.

Remember

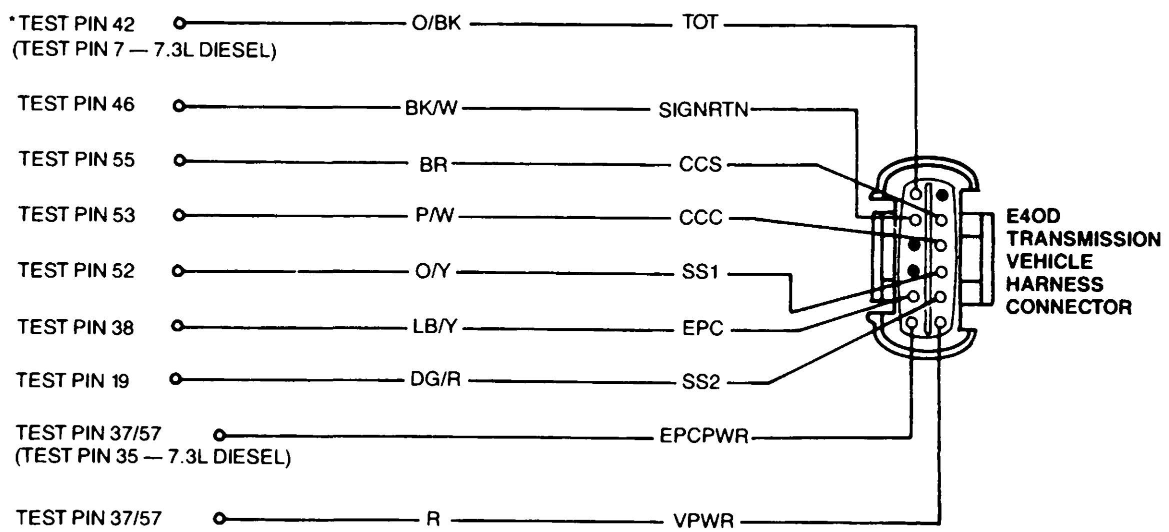
Be aware that the E4OD transmission solenoid assembly (-7G391-) and the MLP (Manual Lever Position:-7F293-) sensor are not analyzed in this Pinpoint Test diagnostics, but are analyzed in the Truck Shop Manual, Group 17.

This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: CCC, CCS, 4X4 LOW, EPC, OCIL, OCS, SS1, SS2, SIGNRTN, TOT, MLP and VPWR.
- Processor Assembly (-12A650-) or (-12B565-) on 7.3L Diesel.

Pinpoint Test Schematic

E40D HARNESS SCHEMATIC



•TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A12820-A

Test Pins 35 & 37/57 EPCPWR

Application	Wire Color
7.3L Diesel	Y/W
5.8L & 7.5L	R or R/W

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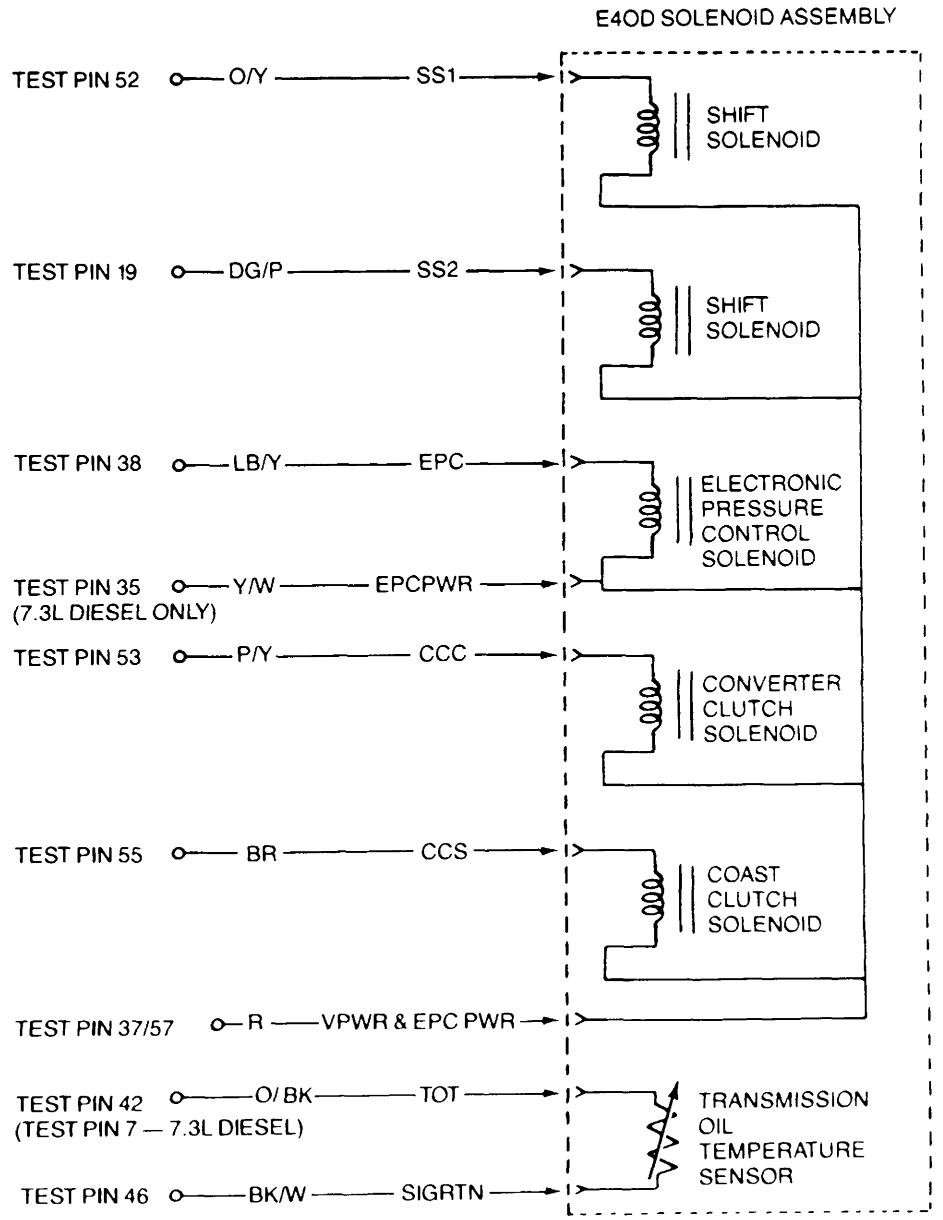
Transmission — E4OD

Pinpoint Test | **TC**

Pinpoint Test Schematic



A12821-A

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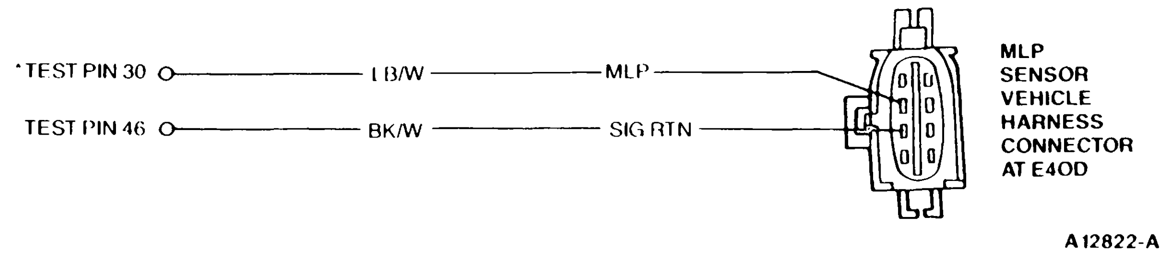
Transmission — E4OD

Pinpoint Test

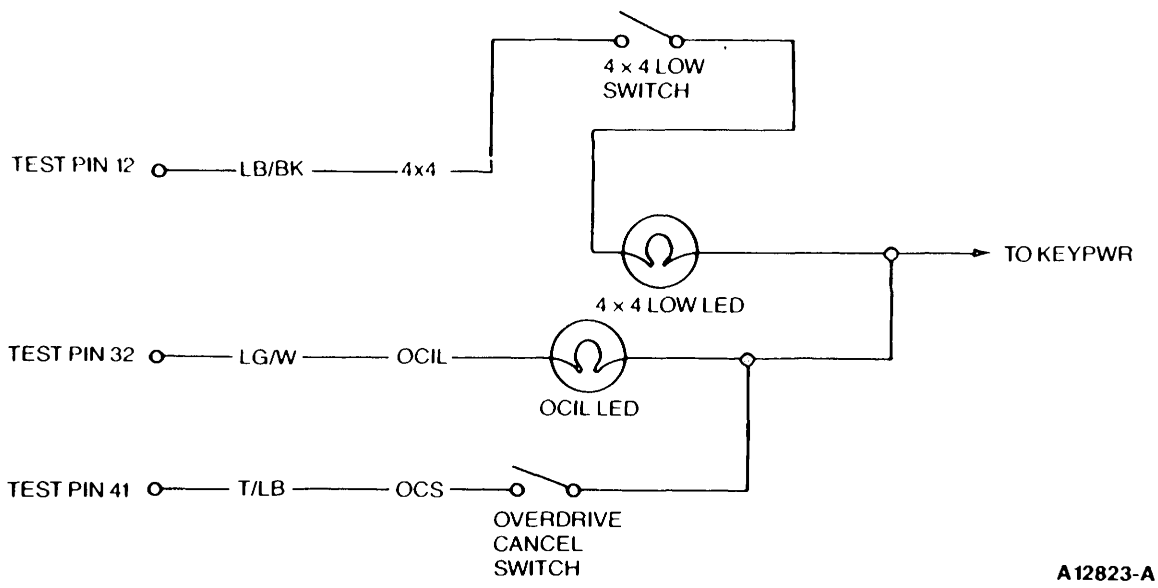
TC

Pinpoint Test Schematic

MANUAL LEVER POSITION (MLP) HARNESS SCHEMATIC



4 × 4 LOW AND OVERDRIVE CANCEL HARNESS SCHEMATIC



* TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

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Transmission — E4OD

Pinpoint Test **TC**

TEST STEP	RESULT	ACTION TO TAKE
TC1 SERVICE CODE 67: CHECK RESISTANCE THROUGH THE MLP SENSOR		
Service Code 67 indicates that the total resistance within the MLP (Manual Lever Position) sensor is out of Self-Test range when the selector lever is in PARK (correct range is 3770 to 4607 ohms). Possible causes are: — Faulty MLP sensor — Open or shorted harness — Faulty processor • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 10,000 ohm scale. • Key On, engine off. • Refer to MLP Sensor Resistance Specification Table #1. Read the ohmmeter between Test Pin 30 and 46 at the breakout box, while moving the selector from Park to Low and back to Park position (recording each resistance at each selector position). • **Are resistances within specifications?**	Yes ▶ No ▶	GO to TC3 . GO to TC2 .

Manual Lever Position (MLP) Sensor Resistance Specification Table #1

Transmission Shift Position	Resistance (ohms)	
	Rmin	Rmax
P	3770	4607
R	1304	1593
N	660	807
D	361	442
2	190	232
1	78	95

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Transmission — E4OD

Pinpoint Test TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC2 CHECK CONTINUITY OF MLP HARNESS		
o Key off. o MLP disconnected from harness. o Using a mirror, inspect both ends of the transmission harness connector at the MLP for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o Breakout box installed, processor disconnected. o DVOM on 200 ohm scale. o Measure the resistance between Test Pin 30 at the breakout box and the same pin at the MLP vehicle harness connector. o Measure the resistance between Test Pin 46 at the breakout box and the same pin at the MLP sensor vehicle harness connector. o **Are both resistances less than 5 ohms?**	Yes ▶ No ▶	GO to TC3 . SERVICE open circuit(s). REMOVE breakout box. RECONNECT processor and MLP sensor. RERUN Quick Test.
TC3 CHECK MLP HARNESS FOR SHORT TO POWER OR GROUND		
o Key off. o MLP disconnected from harness. o Breakout box installed, processor disconnected. o DVOM on 200,000 ohm scale. o Measure the resistance between Test Pin 30 and Test Pin 37 and 57 at the breakout box. o Measure the resistance between Test Pin 30 and Test Pins 40, 46 and 60 at the breakout box and between Test Pin 30 at the breakout box and chassis ground. o **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to TC4 . SERVICE short circuit(s). REMOVE breakout box. RECONNECT processor and MLP sensor. RERUN Quick Test.

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Transmission — E4OD

Pinpoint Test TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC4 CHECK PROCESSOR OUTPUT VOLTAGE		
• Key off. • MLP disconnected from harness. • Breakout box installed. • Connect processor to breakout box. • Key on, engine off. • DVOM on 20 volt scale. • Measure the voltage between Test Pin 30 and Test Pin 46 at the breakout box. • **Is voltage between 4.75 and 5.25 volts?**	Yes ▶ No ▶	GO to Truck Shop Manual, Group 17; for MLP adjustment or service. REPLACE processor. REMOVE breakout box. RECONNECT MLP sensor. RERUN Quick Test.
TC10 SERVICE CODE 47, 65, OR 97: VERIFY VEHICLE SELF-TEST STATE		
Service Code 47 indicates that the 4x4 Low selector lever is not in the 4x2 or 4x4 High position (observed in Key On Engine Off Self-Test). An early shift in 4x4 High range is likely. Service Code 65 indicates that Overdrive Cancel Switch (OCS) is not cycled between the engine I.D. code and the "Goose Test" in Key On Engine Running Self-Test. Service Code 97 indicates an Overdrive Cancel Light circuit problem (observed in Key On Engine Off Self-Test). Possible causes are: — Faulty 4x4 Low switch — Faulty OCS switch — Burned out bulb — Open harness — Shorted harness — Faulty processor • Rerun Quick Test. • **Are any of the above codes present?**	Yes ▶ No ▶	For code 97: GO to TC12 . All others: GO to TC11 . Unable to duplicate fault. Testing is complete

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Transmission — E4OD

Pinpoint Test | **TC**

TEST STEP	RESULT ▶	ACTION TO TAKE
TC11 CYCLE THE APPROPRIATE CIRCUIT: (4x4 LOW OR OVERDRIVE CANCEL)		
∘ Key off, wait 10 seconds. ∘ Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, loose wires, etc. Service as necessary. ∘ Install breakout box, leave processor disconnected. ∘ Key on, engine off. ∘ DVOM on 20 volt scale. **For 4x4 low circuit:** ∘ Measure voltage between Test Pin 12 and Test Pin 40/60 at the breakout box while cycling the 4x4 low switch. ∘ Move transfer case lever between 4x2 position several times. **For overdrive cancel circuit:** ∘ Measure voltage between Test Pin 41 and Test Pin 40/60 at the breakout box while cycling the overdrive cancel switch. ∘ Move the switch toggle on the dash several times. ∘ **Does the voltage cycle?**	Yes ▶ No ▶	REMOVE breakout box. REPLACE processor. RERUN Quick Test. If you were here originally for a driveability symptom only, GO to **TC14**. All others, GO to **TC12**.
TC12 CHECK CIRCUIT(S) FOR SHORT TO GROUND		
∘ Key off. ∘ Breakout box installed, processor disconnected. ∘ DVOM on 200,000 ohm scale. **For 4x4 low circuit:** ∘ Disconnect 4x4 low switch. ∘ Measure resistance between Test Pin 12 and Test Pin 40/60 at the breakout box. **For overdrive cancel circuit:** ∘ Disconnect overdrive cancel switch. ∘ Measure resistance between Test Pin 41 and Test Pin 40/60 at the breakout box. ∘ Measure resistance between Test Pin 32 and Test Pin 40/60 at the breakout box. ∘ **Are the resistance(s) greater than 10,000 ohms?**	Yes ▶ No ▶	For original code 47 or 65: GO to **TC15**. For original code 97: GO to **TC13**. For original code 47: SERVICE short circuit. RERUN Engine Off Self-Test. For original code 65: SERVICE short circuit. RERUN Engine Running Self-Test. If code is still present, GO to **TC14**. For original code 97: SERVICE short circuit. RERUN Engine Off Self-Test.

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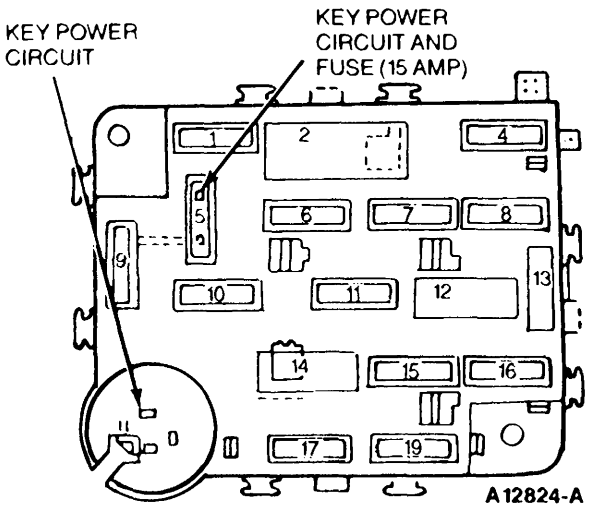
Transmission — E4OD

Pinpoint Test **TC**

TEST STEP	RESULT ▶	ACTION TO TAKE
TC13 CHECK KEYPOWER THROUGH OCIL CIRCUIT		
• Key on, engine off. • Breakout box installed, processor disconnected. • DVOM on 20 volt scale. • Measure voltage between Test Pin 32 and Test Pin 40/60 at breakout box. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	REMOVE breakout box. REPLACE processor. RERUN Quick Test. GO to TC14 .
TC14 CHECK CONTINUITY OF THE (4X4 LOW OR OVERDRIVE CANCEL) LED HARNESS		
NOTE: When entering this Test Step with a driveability symptom or a clean Self-Test code; first, disconnect processor 60 pin connector. Inspect for damaged pins, pushed out pins, loose wires, etc. Service as necessary. • Key off. • Breakout box installed, processor disconnected. • The 4x4 low switch (or overdrive cancel switch) disconnected. • DVOM on 200 ohm scale. **For 4x4 low circuit:** • Measure the resistance between keypower at the fuse panel shown below (ohmmeter positive probe) and Test Pin 12 at the breakout box (ohmmeter negative probe). **For OCS-OCIL circuit:** • Measure the resistance between keypower at the fuse panel shown below (ohmmeter positive probe) and Test Pin 32 at the breakout box (ohmmeter negative probe). • **Are the resistances less than 5 ohms?** 	Yes ▶ No ▶	GO to TC15 . Inspect for defective indicator bulb (4x4 low LED or OCIL) or defective fuse in fuse panel. If OK, SERVICE open circuit. REMOVE breakout box. RECONNECT processor and switch(s). RERUN Quick Test.

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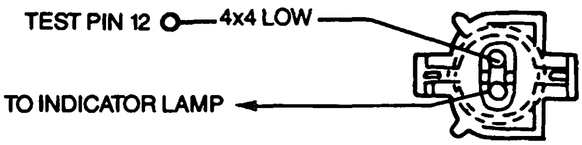
Transmission — E4OD

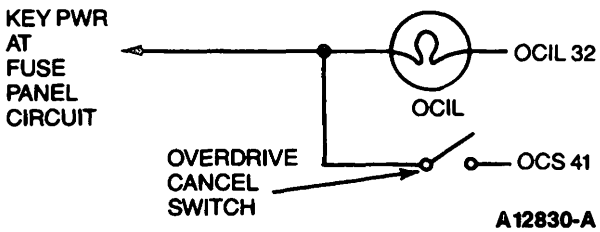
Pinpoint Test **TC**

TEST STEP	RESULT ▶	ACTION TO TAKE
TC15 CHECK CONTINUITY OF THE (4X4 LOW OR OVERDRIVE CANCEL) SWITCH HARNESS		
• Key off. • Breakout box connected, processor disconnected. • Appropriate switch disconnected. • DVOM on 200 ohm scale. **For 4x4 LOW circuit:** • Measure the resistance between Test Pin 12 at the breakout box and 4x4 LOW circuit at the 4x4 LOW switch vehicle harness connector.	Yes ▶	Go to TC16.
	No ▶	SERVICE open circuit(s). REMOVE breakout box. RECONNECT processor and switch(s). RERUN Quick Test.



For OCS-OCIL circuit:

- Measure the resistance between keypower at the fuse panel shown in Pinpoint Test Step TC14 (ohmmeter positive probe) and the power side of the OCS harness connector (ohmmeter negative probe).
- Measure the resistance between Test Pin 41 at the breakout box and the signal side of the OCS harness connector.



- **Are the resistances less than 5 ohms?**

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Transmission — E4OD

Pinpoint Test **TC**

TEST STEP	RESULT ▶	ACTION TO TAKE
TC16 CHECK CIRCUIT(S) FOR SHORTS TO POWER		
• Key off. • Breakout box installed; processor disconnected. • DVOM on 200,000 ohm scale. **For 4x4 LOW circuit:** • 4x4 LOW switch disconnected. • Measure resistance between Test Pin 12 and Test Pin 37 and 57 at the breakout box. **For overdrive cancel circuit:** • Overdrive cancel switch disconnected. • Measure resistance between Test Pin 41 and Test Pin 37 and 57 at the breakout box. • Measure resistance between Test Pin 32 and Test Pin 37 and 57 at the breakout box. • **Are the resistance(s) greater than 10,000 ohms?**	Yes ▶ No ▶	REMOVE breakout box. REPLACE defective switch, either 4x4L range switch or overdrive cancel switch (OCS) due to service code received RERUN Quick Test. SERVICE short circuit(s). REMOVE breakout box. RECONNECT processor and switch(s). RERUN Quick Test.

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Transmission — E4OD

Pinpoint Test TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC17 SERVICE CODE 91, 92, 93, 94, 98, or 99: CIRCUIT IDENTIFICATION		
Service Code(s) 91, 92, 93, 94 indicates that the appropriate On/Off solenoid below is out of Self-Test range which may induce harsh, early, or late shifts. Correct range measurement is 9.00 to 14.50 volts when On, and less than 1.00 volt when Off. Service Code 98 indicates that the Electronic Pressure Control solenoid may have an inoperative driver in the processor. Service Code 99 indicates that the EPC circuit problem may induce transmission clutch wear and harsh shifts.	Yes ▶	For 5.8L/7.5L E4OD: GO to TC18. For 7.3L Diesel E4OD: GO to TC20.
Possible causes are: — Solenoid resistance is out of limits — Open or grounded harness — Faulty processor • Run Key On Engine Off Self-Test. • Verify code match per following chart:	No ▶	GO to Quick Test Step 3.0 for appropriate direction on any other codes.

Solenoid	Processor Signal Test Pin	K.O.E.O. Self-Test Code
SS1	52	91
SS2	19	92
CCS	55	93
CCC	53	94
EPC	38	98/99

SS1 - Shift Solenoid #1
SS2 - Shift Solenoid #2
CCS - Coast Clutch Solenoid
CCC - Converter Clutch Solenoid
EPC - Electronic Pressure Control

• **Are any of the above codes present?**

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Transmission — E4OD

Pinpoint Test | **TC**

TEST STEP	RESULT ▶	ACTION TO TAKE
TC18 ENTER OUTPUT STATE CHECK (REFER TO QUICK TEST APPENDIX)		
NOTE: DO NOT perform Output State Check on 7.3L Diesel-E4OD vehicles because damage to transmission and vehicle may occur. This check is for 5.8L/7.5L E4OD VEHICLES ONLY. Do not use STAR tester for this step, use VOM/DVOM. • Key off, wait 10 seconds. • DVOM on 20 volt scale. • Connect DVOM negative test lead to STO circuit at Self-Test connector and positive test lead to battery positive. • Jumper STI circuit to SIGNAL RETURN at the Self-Test connector. • Perform Key On Engine Off Self-Test until the completion of the Continuous Test Codes. • DVOM will indicate less than 1.0 volt when test is completed. • Depress and release the throttle. • **Does voltage increase?**	Yes ▶ No ▶	REMAIN in Output State Check. GO to TC19 . DEPRESS throttle to WOT and Release. If STO voltage does not go high, GO to Pinpoint Test Step QC1 . Leave equipment hooked up.
TC19 CHECK SUSPECT E4OD SOLENOID ELECTRICAL OPERATION		
• Key on, engine off. • Disconnect transmission bulkhead connector at E4OD solenoids. • Using a mirror, inspect both ends of the connector for damaged or pushed out pins, corrosion, loose wires, ect. Service as necessary. • Connect DVOM positive test lead to VPWR circuit and negative test lead to the processor signal test pin (refer to table in TC17) at the bulkhead connector. • DVOM on 20 volt scale. • While observing DVOM, depress and release the throttle several times to cycle output On and Off. • **Does the suspect solenoid output circuit voltage change greater than 1.0 volt?**	Yes ▶ No ▶	GO to Truck Shop Manual, Group 17 for E4OD transmission service. REMOVE jumper. GO to TC20 .

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Transmission — E4OD

Pinpoint Test **TC**

TEST STEP		RESULT ▶	ACTION TO TAKE
TC20	CHECK E4OD TRANSMISSION SOLENOID RESISTANCE		
	• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Connect transmission bulkhead connector. • DVOM on 200 ohm scale. • Measure the resistance between Test Pin 37/57 and processor signal test pin (refer to table in |**TC17**|) at the breakout box. • **Is the resistance within specification per the chart below?**	Yes ▶ No ▶	GO to |**TC22**|. GO to |**TC21**|.

Ambient Temperature			Resistance (OHMS)	
°C	°F	Solenoid	MIN	MAX
− 40 to 0	− 40 to 32	SS, CCC, CCS	16.00	20.50
		EPC	3.25	4.25
0 to 110	32 to 230	SS, CCC, CSS	20.50	30.00
		EPC	4.25	6.50

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Transmission — E4OD

Pinpoint Test TC

TEST STEP	RESULT	ACTION TO TAKE
TC21 CHECK CONTINUITY OF E4OD TRANSMISSION SOLENOID HARNESS		
NOTE: When entering this pinpoint test for a 7.3L Diesel, initially use a mirror to inspect both ends of the transmission bulkhead connector for damaged or pushed out pins, corrosion, loose wires, ect. Service as necessary. • Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • Disconnect transmission bulkhead connector (E4OD solenoids). • DVOM on 200 ohm scale. • Measure the resistance between the processor signal test pin (refer to table in TC17) at the breakout box and the same test pin at the E4OD transmission vehicle harness bulkhead connector. • Measure the resistance between Test Pin 37/57 (Test Pin 35 for 7.3L Diesel) at the breakout box and both the EPCPWR pin and the VPWR pin at the E4OD transmission vehicle bulkhead harness connector. (Refer to the first Pinpoint Test Schematic in TC). • **Are all resistances less than 5 ohms?**	Yes ▶ No ▶	GO to TC22. REMOVE breakout box. SERVICE open circuit. RECONNECT processor and solenoid(s). RERUN Quick Test.
TC22 CHECK E4OD SOLENOID HARNESS FOR SHORT TO GROUND		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • Transmission bulkhead connector disconnected. • DVOM on 200,000 ohm scale. • Measure the resistance between the processor signal test pin (refer to table in TC17) and Test Pins 40, 46 and 60 at the breakout box and between the processor signal test pin at the breakout box and chassis ground. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to TC23. SERVICE short circuit(s). REMOVE breakout box. RECONNECT processor and solenoid(s). RERUN Quick Test.

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Transmission — E4OD

Pinpoint Test **TC**

TEST STEP	RESULT ▶	ACTION TO TAKE
TC23 CHECK E4OD SOLENOID HARNESS FOR SHORT TO POWER		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • Transmission bulkhead connector disconnected. • DVOM on 200,000 ohm scale. • Measure the resistance between the processor signal test pin (refer to table in TC17) and Test Pins 37 and 57 at the breakout box. • **Are resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to TC24. SERVICE short circuit(s). REMOVE breakout box. RECONNECT processor and solenoid(s). RERUN Quick Test.
TC24 CHECK VOLTAGE OF VPWR TO E4OD TRANSMISSION SOLENOIDS		
• Key off. • Breakout box installed. • Connect processor to breakout box. • Transmission bulkhead connector disconnected. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between Test Pins 37 and 57 at the bulkhead connector and chassis or battery ground. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to TC25. REPLACE processor. REMOVE breakout box. RECONNECT solenoid(s). RERUN Quick Test.

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Transmission — E4OD

Pinpoint Test **TC**

TEST STEP	RESULT ▶	ACTION TO TAKE
TC25 CHECK SOLENOID DRIVER SIGNAL		
Requires standard non-power 12 volt lamp. • Key off. • Breakout box installed, processor connected. • Bulkhead connector disconnected. • Connect test lamp between Test Pin 37 or 57 and processor signal test pin (refer to table in TC17) at the breakout box. • Key on, engine off (wait 10 seconds). • Now initiate Key On Engine Off Self-Test. • **Does test lamp flash momentarily and then stay off?**	Yes ▶ No ▶	GO to Truck Shop Manual, Group 17 for E4OD transmission service. TEST LAMP NEVER FLASHED: Solenoid Driver open in processor. REPLACE processor. RECONNECT solenoid(s) RERUN Quick Test. TEST LAMP ALWAYS ON: Solenoid Driver shorted to ground in processor. REPLACE processor. RECONNECT solenoid(s). RERUN Quick Test.
TC30 SERVICE CODE 26: CHECK TRANSMISSION OIL OPERATING TEMPERATURE		
Service Code 26 indicates that the Transmission Oil Temperature sensor (TOT) is out of Self-Test range. Correct range of measurement is 0.21 to 3.50 volts. Possible causes are: — TOT resistance is out of limits — Faulty processor • Drive vehicle through normal shift cycle in city traffic for 20 to 30 minutes to bring transmission oil temperature to at least 50 degrees Fahrenheit. If outside ambient temperature is less than -2 degrees Fahrenheit the vehicle may require a longer drive warm-up time. • Rerun Quick Test. • **Is code 26 present?**	Yes ▶ No ▶	GO to TC31 . SERVICE other codes as necessary.

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Transmission — E4OD | Pinpoint Test | TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC31 CHECK FOR VREF AT THROTTLE POSITION SENSOR		
o Refer to schematic in Pinpoint Test DH or DQ. o Key off, wait 10 seconds. o Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o Install breakout box and connect processor to breakout box. o Disconnect TP (FIPL on 7.3L Diesel) sensor. o DVOM on 20 volt scale. o Key on, engine off. o Measure voltage between VREF and SIGNAL RETURN at the TP (or FIPL) vehicle harness connector. o **Is voltage between 4.0 and 6.0 volts?**	Yes ▶ No ▶	RECONNECT TP (or FIPL) sensor, GO to TC32. GO to Pinpoint Test Step C1.

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Transmission — E4OD

Pinpoint Test **TC**

TEST STEP	RESULT ▶	ACTION TO TAKE
TC32 CHECK RESISTANCE OF TOT SENSOR		
NOTE: Transmission oil temperature may have cooled down. The oil temperature must be at a minimum of 50 degrees Fahrenheit before taking TOT resistance measurement. Re-drive vehicle if necessary. • Key off, wait 10 seconds. • Breakout box installed. • Disconnect processor. • Bulkhead connector connected at transmission. • DVOM on 200,000 ohm scale. • Key on, engine off. • Carefully touch the transmission oil pan on the driver's side, away from the exhaust system. The transmission oil pan should be warm to the touch. (As a guide, 'warm to the touch' is about 41-70 degrees C (105-158 degrees F)). • Measure the resistance between Test Pin 42 (or Test Pin 7 on 7.3L diesel) and Test Pin 46 at the breakout box. (Refer to TOT Sensor Resistance Specification Table #2). • **Is the resistance within specification for the appropriate measured transmission oil temperature?**	Yes ▶ No ▶	GO to TC33 . REMOVE breakout box. RECONNNECT processor and TOT sensor, GO to Truck Shop ManuaL, Group 17 for transmission service of the TOT sensor.

Transmission Oil Temperature (TOT) Sensor Resistance Specification Table #2

Transmission Oil Temperature		Resistance Range (ohms)
°C	°F	
0 - 20	32 - 58	100K - 37K
21 - 40	59 - 104	37K - 16K
41 - 70	105 - 158	16K - 5K
71 - 90	159 - 194	5K - 2.7K
91 - 110	195 - 230	2.7K - 1.5K
111 - 130	231 - 266	1.5K - 0.8K

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Transmission — E4OD

Pinpoint Test **TC**

TEST STEP		RESULT ▶	ACTION TO TAKE
TC33	CHECK TOT SENSOR RESISTANCE SHIFT VS OIL TEMPERATURE SHIFT		
	NOTE: The TOT sensor may sometimes show within the appropriate resistance specification (0.8K to 100K ohms) and not be in the corresponding temperature range. This increases the chances of not being able to determine the integrity of the TOT sensor. ∘ Check again for the transmission temperature by touching the transmission oil pan. — If it is cold, run the vehicle for a short time to heat it up. — If it is too hot to touch, let the vehicle and transmission cool down. ∘ Measure the TOT sensor resistance again and compare it to the resistance received in Pinpoint Test Step TC32. ∘ **Did the resistance decrease upon heating the transmission or increase upon cooling down the transmission significantly?**	Yes ▶ No ▶	REPLACE processor. RERUN Quick Test. REMOVE breakout box. RECONNECT processor, GO to Truck Shop Manual, Group 17 for TOT sensor replacement procedures.
TC40	SERVICE CODE 56: ATTEMPT TO GENERATE CODE 66		
	Service Code 56 indicates that the Transmission Oil Temperature Sensor (TOT) signal is greater than Self-Test maximum value of 4.80 volts. Possible causes are: — Faulty TOT sensor — Open harness — Faulty processor ∘ Key off, wait 10 seconds. ∘ Disconnect the transmission bulkhead connector from the TOT sensor. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. ∘ Insert a jumper wire at the bulkhead connector between TOT SIGNAL and SIGNAL RETURN. ∘ Run Key On Engine Off Self-Test. ∘ **Is code 66 present?**	Yes ▶ No ▶	REMOVE jumper wire, GO to Truck Shop Manual, Group 17 for transmission service of the TOT sensor. REMOVE jumper wire. GO to TC41.

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Transmission — E4OD

Pinpoint Test **TC**

TEST STEP		RESULT ▶	ACTION TO TAKE
TC41	CHECK CONTINUITY OF TOT SIGNAL AND SIGNAL RETURN		
	• Key off, wait 10 seconds. • Bulkhead connector disconnected at transmission. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure the resistance between TOT SIGNAL at the bulkhead connector and Test Pin 42 (or Test Pin 7 on 7.3L diesel) at the breakout box. • Measure the resistance between SIGNAL RETURN at the bulkhead connector and Test Pin 46 at the breakout box. • **Are both resistances less the 5 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT processor and bulkhead connector. RERUN Quick Test. SERVICE open circuit(s). REMOVE breakout box. RECONNECT processor and bulkhead connector. RERUN Quick Test.
TC50	SERVICE CODE 66: ATTEMPT TO GENERATE CODE 56		
	Service Code 66 indicates that the Transmission Oil Temperature Sensor (TOT) signal is less than the Self-Test minimum value of 0.15 volts. Possible causes are: — Faulty TOT sensor — Grounded harness — Faulty processor • Key off, wait 10 seconds. • Disconnect the transmission bulkhead connector from the bulkhead connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Run Key On Engine Off Self-Test. • **Is code 56 present?**	Yes ▶ No ▶	GO to Truck Shop Manual, Group 17 for transmission service of the TOT sensor. GO to TC51 .

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Transmission — E4OD

Pinpoint Test **TC**

TEST STEP	RESULT ▶	ACTION TO TAKE
TC51 CHECK FOR VREF AT THROTTLE POSITION SENSOR		
• Refer to schematic in Pinpoint Test DH or DQ. • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • Disconnect TP (FIPL on 7.3L diesel) sensor. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between VREF and SIGNAL RETURN at the TP (or FIPL) vehicle harness connector. • **Is voltage between 4.0 and 6.0 volts?**	Yes ▶ No ▶	RECONNECT TP (or FIPL) sensor, GO to TC52 . GO to Pinpoint Test Step C1 .
TC52 CHECK TOT SIGNAL FOR SHORT TO GROUND		
• Key off, wait 10 seconds. • Bulkhead connector disconnected at transmission. • Breakout box installed. • Disconnect processor. • DVOM on 200,000 ohm scale • Measure the resistance between Test Pin 42 (or Test Pin 7 on 7.3L diesel) and Test Pins 40, 46 and 60 at the breakout box. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT processor and bulkhead connector. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT processor and TOT sensor. RERUN Quick Test.

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Transmission — E4OD

Pinpoint Test **TC**

TEST STEP	RESULT ▶	ACTION TO TAKE
TC90 MLP, TOT SENSOR AND E4OD SOLENOID DRIVE CYCLE		
• Bring engine to operating temperature. — Verify correct transmission fluid level. — Verify that all components are connected. • Run Key On Engine Off Self-Test and record Continuous Memory Codes. — If codes 49, 59 or 69 are present	▶	GO to TC96.
— If codes 49, 59 or 69 are not present, record and clear Continuous Memory Self-Test Codes. • With transmission in D range, and OD enable set. — Drive in city traffic with moderate accelerations. — Hold throttle opening steady while transmission is shifting thorugh all four gears, then hold throttle for an additional 15 seconds. • Apply brakes on coming to a stop and remain stopped for 20 seconds, then repeat drive step above. • Rerun Key On Engine Off Self-Test and record Continuous Memory Codes. — For code 11	▶	GO to TC91.
— For code 29	▶	GO to Pinpoint Test DP.
— For code 56, 62, 66, 67 and 99	▶	GO to TC92.
TC91 ATTEMPT TO GENERATE CONTINUOUS MEMORY CODE 56, 62, 66, 67 and 99		
NOTE: Before performing any procedures in this test step you must complete the drive cycle outlined above. • Take the vehicle on the road again and drive on a rough road for 15 minutes to simulate road shock. • Observe MIL LED while driving for indication of fault. • **Does the MIL flash on and off?**	Yes ▶	RETURN vehicle to repair area. GO to TC92.
	No ▶	Unable to duplicate fault. Testing is completed.

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Transmission — E4OD

Pinpoint Test TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC92 CHECK CIRCUIT USING KEY ON ENGINE OFF CONTINUOUS MONITOR MODE		
• Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: **For MLP sensor (code 67):** • Lightly tap on MLP sensor (simulate road shock). • Wiggle connector at MLP sensor. **For E4OD transmission solenoids (codes 62 or 99) and transmission oil temperature sensor - TOT (codes 56 or 66):** • Wiggle transmission bulkhead connector. • **Is a fault indicated?**	Yes ▶	DISCONNECT and INSPECT connectors. If terminals are good, GO to Shop Manual, Group 17 for MLP, TOT sensor(s) or E4OD solenoid service CLEAR Continuous Memory Code(s). Refer to Quick Test Appendix. Continuous Memory Code testing is complete.
	No ▶	GO to TC93.
TC93 CHECK EEC-IV HARNESS		
• Still in Key On Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: — Referring to the illustration in TC94, grasp the harness closest to the sensor/transmission connector. Wiggle, shake or bend a small section of the EEC-IV system harness while working your way to the dash panel, processor, and transmission. • **Is a fault indicated?**	Yes ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory Code(s). Refer to Quick Test Appendix. RERUN Quick Test.
	No ▶	GO to TC95.

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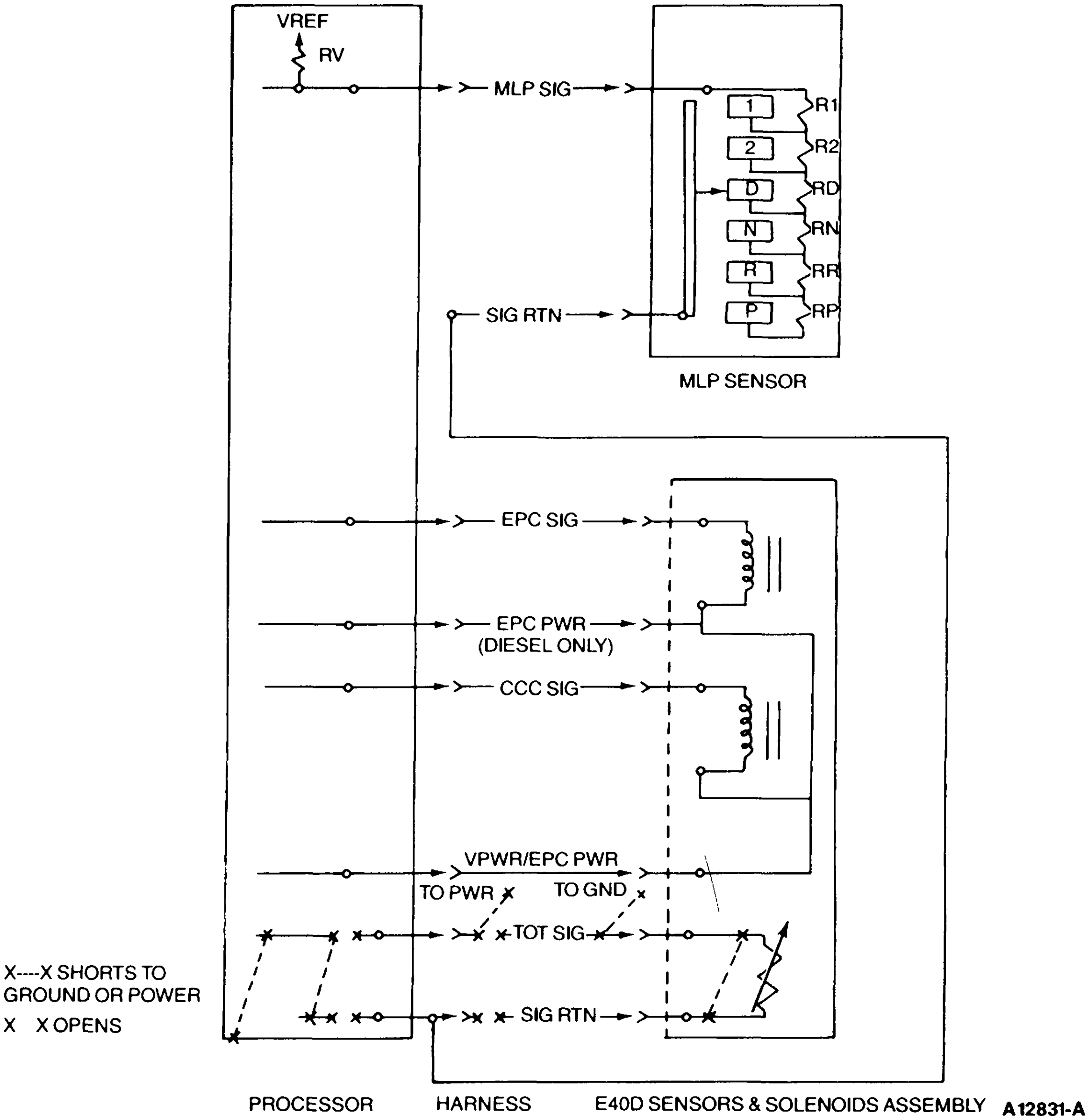
Transmission — E4OD

Pinpoint Test

TC

TC94	SCHEMATIC FOR CONTINUOUS MONITOR MODE ON EEC-IV/E4OD VEHICLE HARNESS



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Transmission — E4OD

Pinpoint Test **TC**

<table>
<tr><th colspan="2">TEST STEP</th><th>RESULT ▶</th><th>ACTION TO TAKE</th></tr>
<tr><td>TC95</td><td>CHECK PROCESSOR AND HARNESS CONNECTORS</td><td></td><td></td></tr>
<tr><td colspan="2">

Key off, wait 10 seconds.
Disconnect processor 60 pin connector. Inspect both connector terminals for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary, damage or faults.
Are connectors and terminals OK?

</td><td>Yes ▶

No ▶</td><td>Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to the EEC-IV Monitor box: Intermittent Fault Diagnostics supplement, Section 18.*

All others, CLEAR Continuous Memory. REFER to Quick Test Appendix.

SERVICE as necessary. CLEAR Continuous Memory Code(s). Refer to Quick Test Appendix. RERUN Quick Test.</td></tr>
<tr><td>TC96</td><td>CONTINUOUS MEMORY CODES 49, 59, 69: FAULT ISOLATION</td><td></td><td></td></tr>
<tr><td colspan="2">
Service Code(s) 49, 59, 69 indicates that the transmission went through four improper shifts in an upward or downward gear range (1-2 gear, 2-3 gear, or 3-4 gear and in reverse direction) consecutively over a period of drive time. When changing a gear position either the SS1 or SS2 solenoid remained On or Off an extended amount of time.

Possible causes are:
— Intermittent harness continuity
— Stuck shift solenoid

Rerun Key On Engine Off Self-Test.
Do any other codes appear in Key On Engine Off Self-Test in addition to the Continuous Memory Codes 49, 59 or 69?

</td><td>Yes ▶

No ▶</td><td>GO to Quick Test Step 3.0 to service other codes.

GO to TC97 .</td></tr>
</table>

* Can be purchased as a separate item.

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Transmission — E4OD

Pinpoint Test **TC**

TEST STEP	RESULT ▶	ACTION TO TAKE
TC97 CHECK CIRCUIT USING KEY ON ENGINE OFF CONTINUOUS MONITOR MODE		
• Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: — Wiggle, shake or bend a small section of the EEC-IV system harness while working your way to the dash panel, processor, and transmission bulkhead connector. • **Is a fault indicated?**	Yes ▶	DISCONNECT and INSPECT connectors and for loose wires. CLEAR Continuous Memory Code(s). Refer to Quick Test Appendix. Continuous Memory Code testing is completed.
	No ▶	GO to Truck Shop Manual, Group 17 for E4OD (SS1 or SS2 solenoid) transmission service.

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Integrated Controller

Pinpoint Test X

Note

You should enter this Pinpoint Test only when service code 72, 78, 82, 83, 87, 88, 95 and 96 are received in Quick Test Steps 3.0 or 6.0, or you are directed here from Pinpoint Test A, Pinpoint Test C, or Quick Test Step 7.0.

Remember

To prevent the replacement of good components, be aware that the following non-EEC area may be at fault:

- Fuel Lines
- Fuel Filters
- Contaminated Fuel
- Fuel Pump
- Ignition Switch
- Battery Cables
- Alternator
- Voltage Regulator
- Ground Straps
- A/C Clutch
- A/C Demand
- Cooling Fan Motor

This Pinpoint Test is intended to diagnose only the following:

- Integrated Relay Controller Module
  - Battery Voltage
  - Power Relay
  - EDF Relay
  - HEDF Relay
  - WAC Relay
  - Fuel Pump Relay
- Harness Circuits: VBAT, VPWR, F.P., GROUND and POWER to Fuel Pump(s), WAC, ACC, ACCS, COOLING FAN POWER, A/C CLUTCH, KEY POWER, POWERS To Integrated Controller
- Processor Assembly (-12A650-)
- A/C Demand Switch Input

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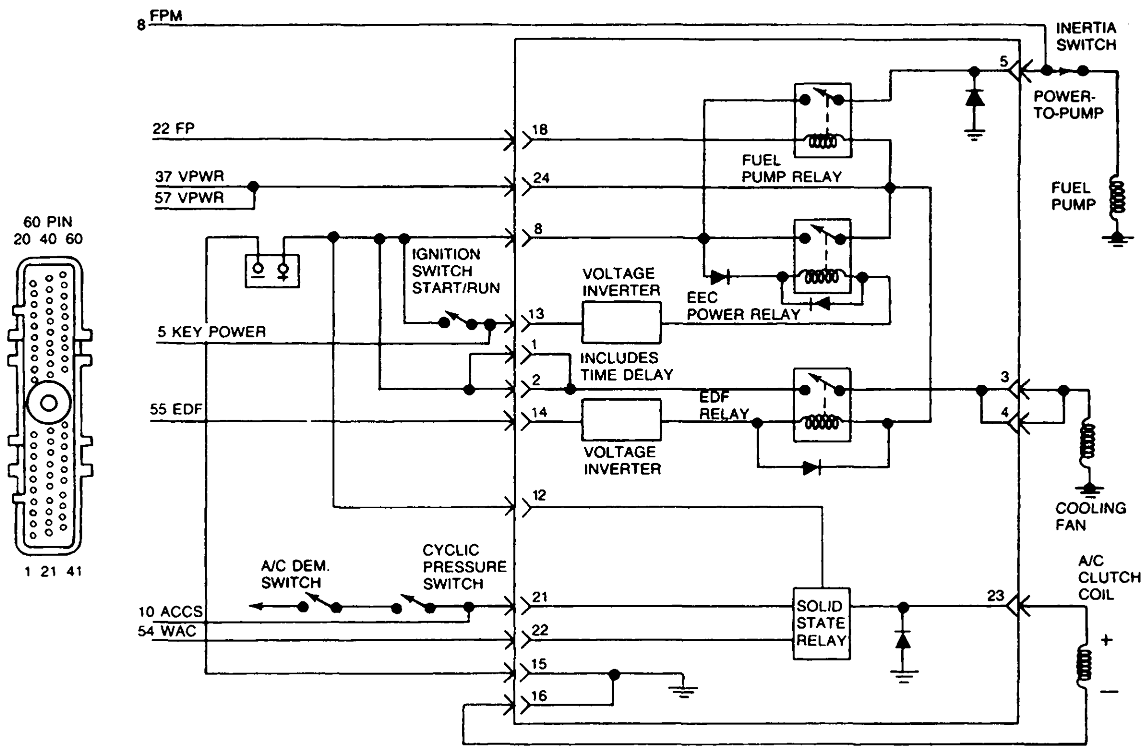
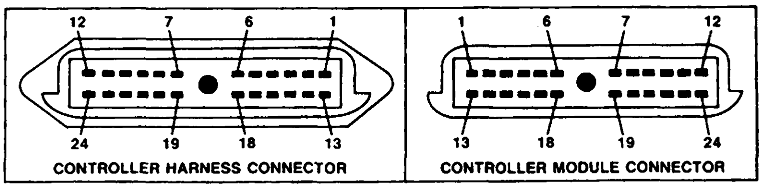
Integrated Controller

Pinpoint Test **X**

Pinpoint Test Schematic

2.5L CFI MTX ONLY





A8374-D

Refer to Engine Supplement for Test Pin Usage Chart.

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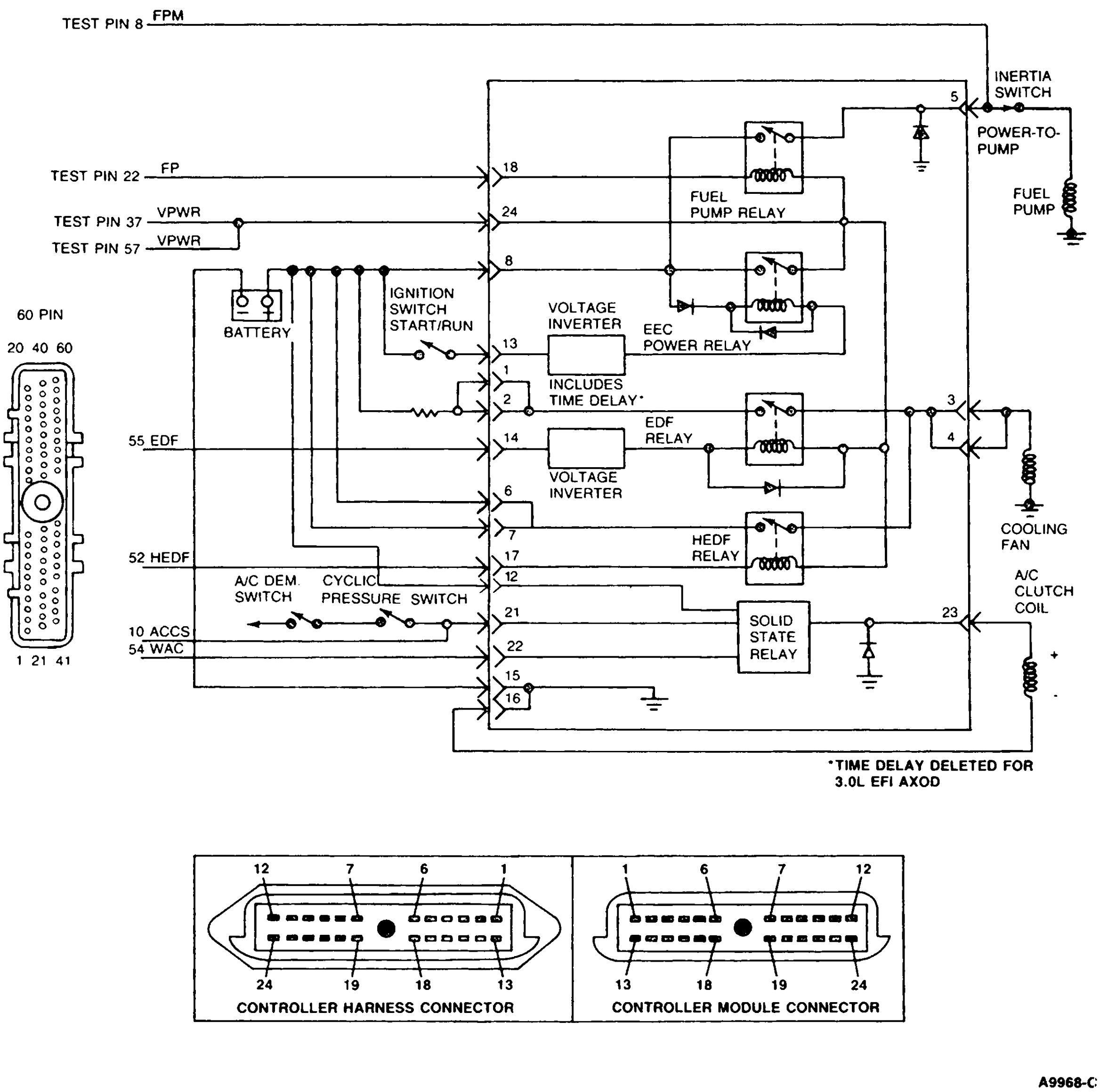
Integrated Controller

Pinpoint Test | **X**

Pinpoint Test Schematic

2.5L CFI CLC and 3.0L EFI AXOD



Refer to Engine Supplement for Test Pin Usage Chart.

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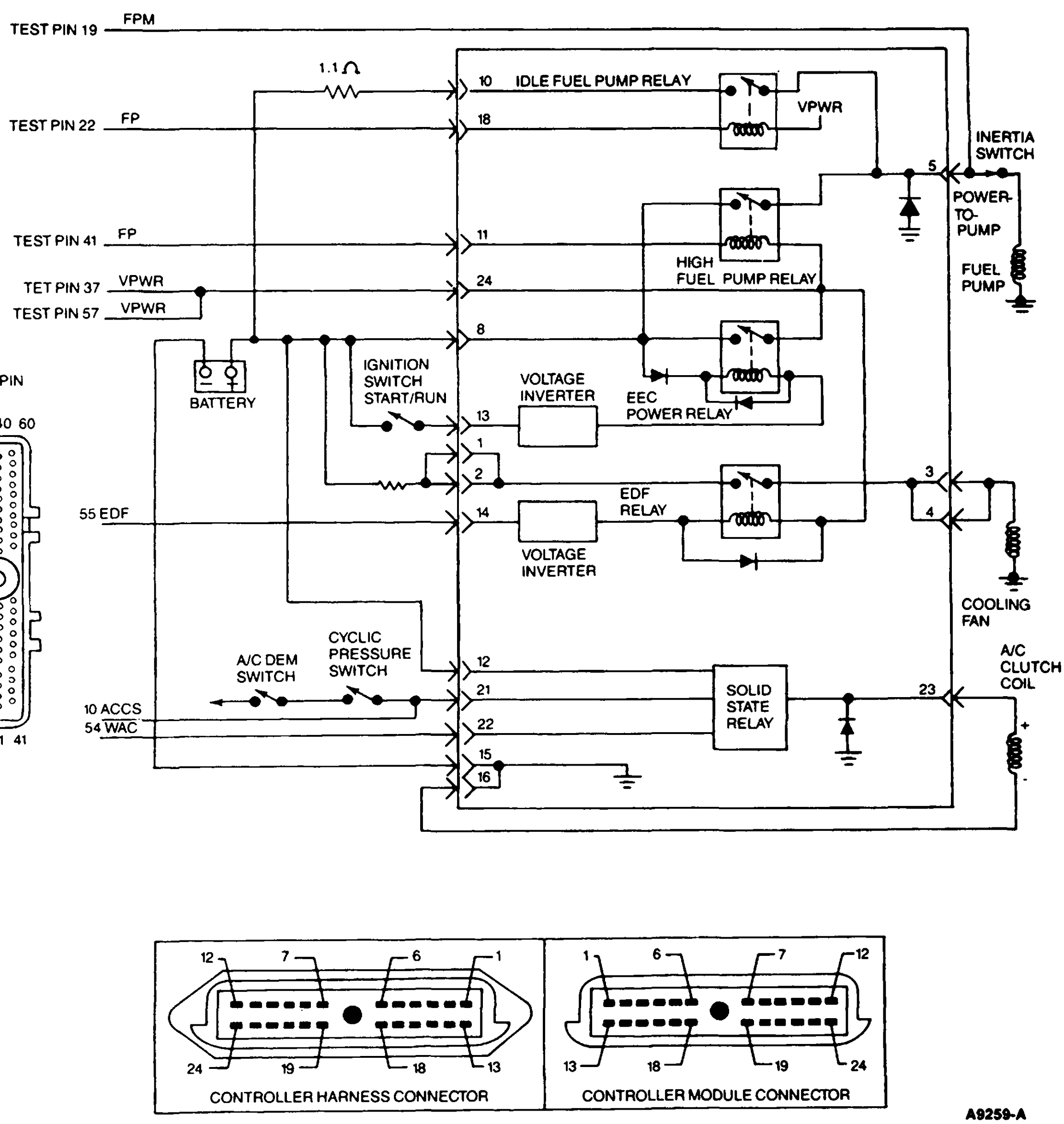
Integrated Controller	Pinpoint Test	X

Pinpoint Test Schematic

3.0L SEFI Super High Output (SHO)



Refer to Engine Supplement for Test Pin Usage Chart.

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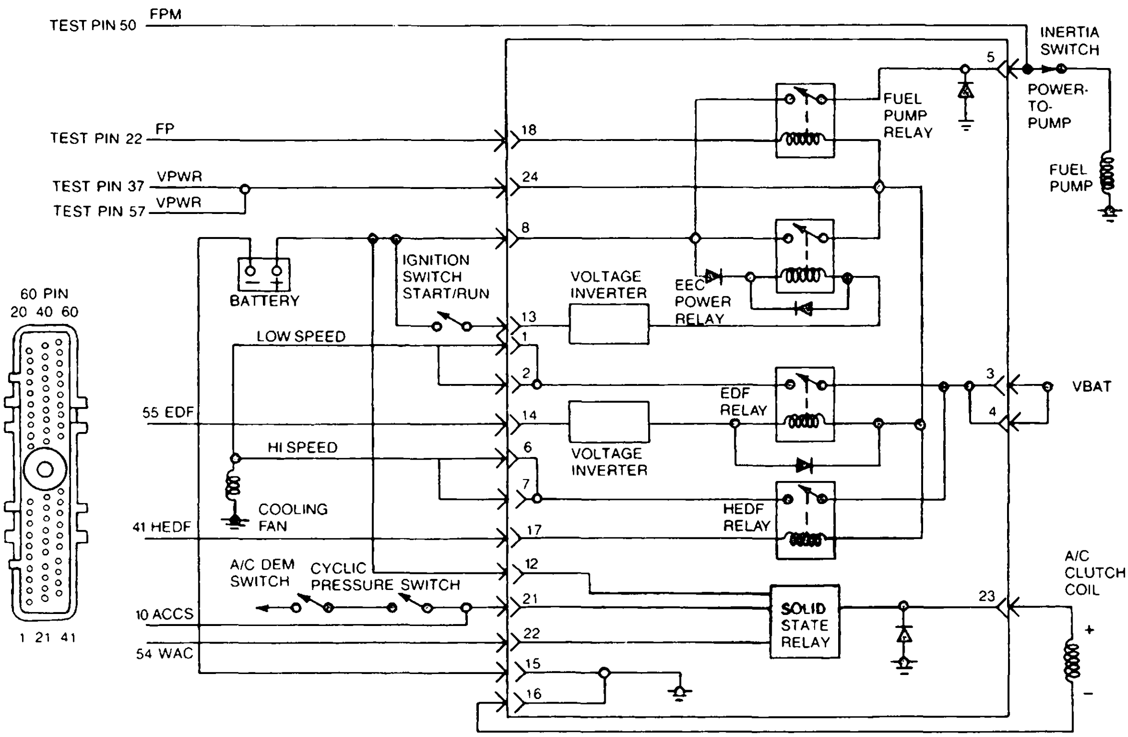
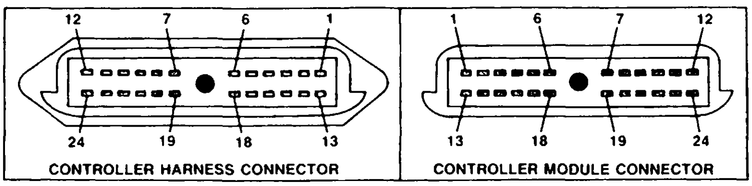
Integrated Controller	Pinpoint Test	X

Pinpoint Test Schematic

3.8L SEFI AXOD





A9916-C

Refer to Engine Supplement for Test Pin Usage Chart.

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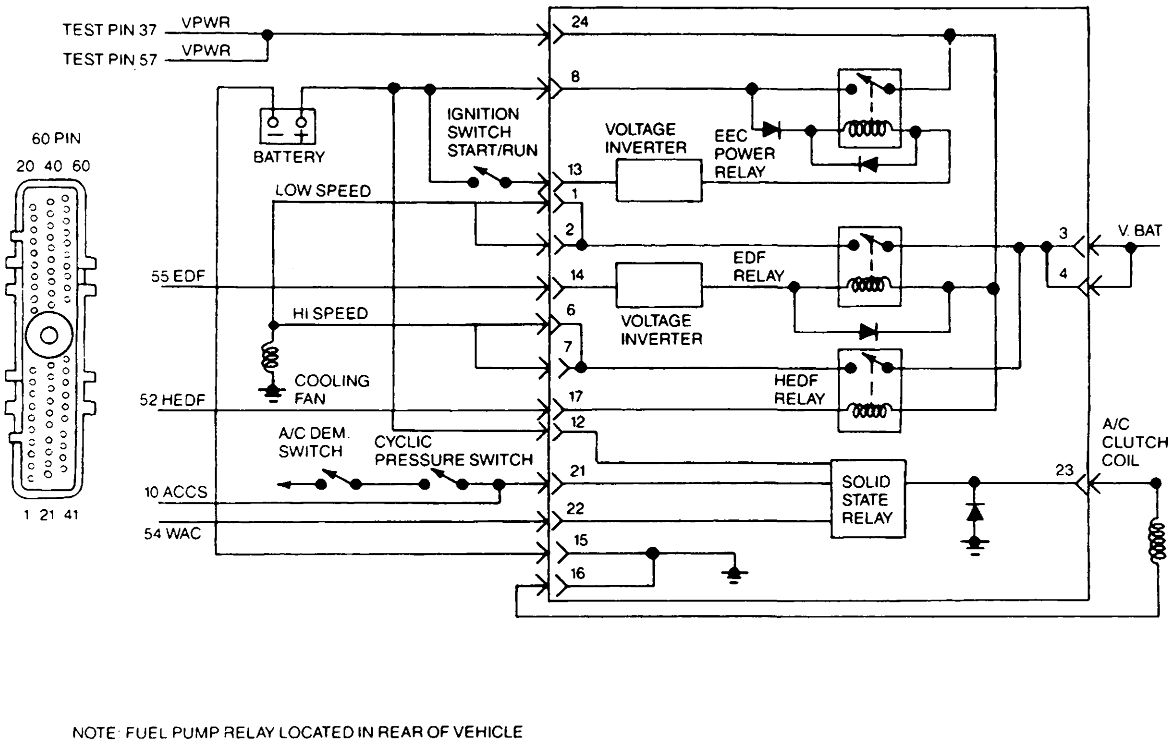
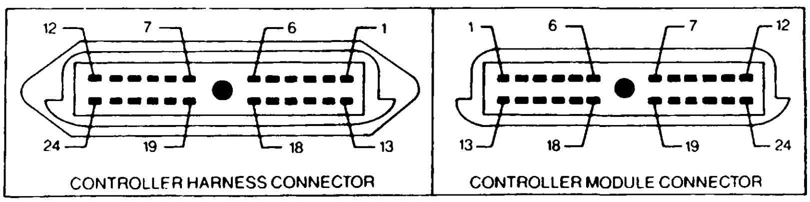
Integrated Controller

Pinpoint Test **X**

Pinpoint Test Schematic

3.8L SEFI SUPERCHARGED





A9258-A

Refer to Engine Supplement for Test Pin Usage Chart.

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Integrated Controller

Pinpoint Test X

TEST STEP	RESULT ▶	ACTION TO TAKE
VEHICLE BATTERY		
X1 CHECK BATTERY VOLTAGE		
• Key on, engine off. • DVOM on 20 volt scale. • Measure voltage across battery terminals. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to X2. SERVICE discharged battery, REFER to Shop Manual, Group 31.
X2 CHECK BATTERY GROUND		
• Key on, engine off. • Processor connected. • DVOM on 20 volt range. • Measure voltage between battery negative post and SIGNAL RETURN circuit in the Self-Test connector. • **Is voltage greater than 0.5 volts?**	Yes ▶ No ▶	GO to X3. GO to X6.
X3 GROUND FAULT ISOLATION		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires etc. Service as necessary. • Install breakout box and connect processor to breakout box. • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between battery negative post and Test Pins 40 and 60 at the breakout box. • **Are both voltages less than 0.5 volts?**	Yes ▶ No ▶	GO to X4. Circuit(s) with greater than 0.5 volts has high resistance or open. SERVICE open ground circuit. RERUN Quick Test.
X4 PROCESSOR GROUND FAULT ISOLATION		
• Key off, wait 10 seconds. • Breakout box installed, processor connected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 46 and Test Pin 40 and between Test Pin 46 and Test Pin 60 at the breakout box. • **Are both resistances less than 5 ohms?**	Yes ▶ No ▶	GO to X5. REMOVE breakout box. REPLACE processor. RERUN Quick Test.

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Integrated Controller

Pinpoint Test **X**

TEST STEP		RESULT ▶	ACTION TO TAKE
X5	CHECK CONTINUITY OF SIGNAL RETURN CIRCUIT		
• Key off, wait 10 seconds. • Breakout box installed, processor connected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 46 at the breakout box and SIGNAL RETURN circuit at Self-Test connector. • **Is resistance less than 5.0 ohms?**		Yes ▶ No ▶	System OK. RUN Quick Test. REMOVE breakout box. RECONNECT processor. SERVICE open circuit. RERUN Quick Test.
X6	MEASURE VOLTAGE AND GROUND TO INTEGRATED CONTROLLER		
• Key off. • Disconnect Integrated Controller Module. • DVOM on 20 volt scale. • Measure voltage between Test Pin 8 and Test Pin 15 at the Integrated Controller vehicle harness connector. • **Is voltage greater than 10.5 volts?**		Yes ▶ No ▶	GO to X7 . GO to X9 .
X7	CHECK KEY POWER TO INTEGRATED CONTROLLER		
• Key off. • Integrated Controller disconnected. • DVOM on 20 volt scale. • Key on. • Measure voltage between Pin 13 and Pin 15 at the Integrated Controller vehicle harness connector. • Refer to schematic in Pinpoint Test X. • **Is voltage greater than 10.5 volts?**		Yes ▶ No ▶	GO to X8 . SERVICE open between Pin 13 and ignition switch. RECONNECT Integrated Controller. RERUN Quick Test.

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Pinpoint Test X

TEST STEP	RESULT ▶	ACTION TO TAKE
X8 MEASURE CONTINUITY OF VPWR		
o Key off. o Integrated Controller disconnected. o Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o Install breakout box, leave processor disconnected. o DVOM on 200 ohm scale. o Measure resistance between Test Pin 37 and 57 at the breakout box and Test Pin 24 at the Integrated Controller harness. o **Is resistance greater than 5.0 ohms?**	Yes ▶	REMOVE breakout box. RECONNECT processor. SERVICE open in VPWR circuit. RECONNECT Integrated Controller. RERUN Quick Test.
	No ▶	REMOVE breakout box. RECONNECT processor. REPLACE Integrated Controller. RERUN Quick Test.
X9 MEASURE CONTINUITY OF POWER GROUND TO INTEGRATED CONTROLLER		
o Key off. o Integrated Controller disconnected. o DVOM on 200 ohm scale. o Measure resistance between battery negative post and at Test Pin 15 at the Integrated Controller connector. o **Is resistance greater than 5.0 ohms?**	Yes ▶	RECONNECT Integrated Controller. SERVICE open in battery ground to Pin 15 (Integrated Controller harness connector). RERUN Quick Test.
	No ▶	RECONNECT Integrated Controller. SERVICE open in battery positive to Pin 8 (Integrated Controller harness connector). RERUN Quick Test.

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TEST STEP		RESULT ▶	ACTION TO TAKE
X10	CODE 72: INTERMITTENT OPEN IN VPWR CIRCUIT		
	NOTE: Code 72 indicates that while key power was present, VPWR had an interrupt, or interference from electrical noises caused the processor to reset, resulting in possible stalls, high idle rpm, lack of power on acceleration or other drive symptoms. Possible Causes: — Intermittent open in VPWR circuit from integrated controller to processor. — EEC power relay intermittent malfunction. — Intermittent open in VBAT circuit to integrated controller. — Intermittent open in KEY POWER circuit to integrated controller. — EEC harness too close to the distributor spark plug wires and other vehicle harnesses. • Using Continuous Monitor Mode (Engine Running) per Quick Test Appendix. Observe VOM or STAR LED for indication of a fault while performing the following: • Shake, bend and twist harness from integrated controller to the processor, to the ignition switch and to battery positive. • **Is a fault indicated or does Code 72 reappear in continuous memory if Quick Test is rerun?**	Yes ▶ No ▶	CHECK for proper routing of EEC harness. SERVICE as necessary. If OK SERVICE intermittent VPWR circuit. RERUN Quick Test. INSPECT component and harness connectors of integrated controller and processor, for loose or damaged pins, corrosion, etc. SERVICE as necessary. If OK, ROAD TEST vehicle through a variety of drive modes. If symptom exists, REPLACE integrated controller, otherwise testing complete. RERUN Quick Test.
X11	CHECK POWER-TO-PUMP(S) CIRCUIT		
	• Key on, engine off. • Locate and disconnect fuel pump(s). • DVOM on 20 volt scale. • Measure voltage between CHASSIS GROUND and POWER-TO-PUMP(S) circuit at fuel pump during crank mode. • **Is voltage greater than 8.0 volts during crank?**	Yes ▶ No ▶	GO to Shop Manual, Group 24, Electric Fuel Pump Diagnosis. GO to $\boxed{X12}$.

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TEST STEP	RESULT ▶	ACTION TO TAKE
X12 CHECK POWER-TO-PUMP CIRCUIT CONTINUITY		
○ Key off. ○ DVOM on 200 ohm scale. ○ Disconnect Integrated Controller. ● Fuel pump(s) disconnected. ● Measure resistance between Pin 5 at the integrated controller vehicle harness connector and POWER-TO-PUMP(S) circuit at the fuel pump vehicle harness connector. ○ **Is resistance less than 5.0 ohms?**	Yes ▶	REPLACE Integrated Controller. RECONNECT all components. RERUN Quick Test.
	No ▶	SERVICE open in POWER-TO-PUMP(S) circuit. RECONNECT Integrated Controller. RERUN QuicK Test.
X14 CHECK POWER-TO-PUMP(S) FOR SHORTS TO POWER		
○ Key off. ○ Disconnect Integrated Controller. ○ Disconnect fuel pumps. ○ DVOM on 200,000 ohm scale. ○ Measure resistance between Pin 5 and Pin 24 at the Integrated Controller vehicle harness connector. ○ Measure resistance between Pin 5 at the Integrated Controller vehicle harness connector and battery positive post. ○ **Is either resistance less than 10,000 ohms?**	Yes ▶	SERVICE short circuit. RECONNECT all components. ATTEMPT to start vehicle. If vehicle runs, RERUN Quick Test. If vehicle will not run, REPLACE Integrated Controller. RERUN Quick Test.
	No ▶	RECONNECT fuel pump. REPLACE Integrated Controller. RERUN Quick Test.

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TEST STEP	RESULT ▶	ACTION TO TAKE
SERVICE CODE: 87/83		
X15 CHECK CONTINUITY OF FUEL PUMP CIRCUIT		
Service Code 87 or 83 indicates that the voltage output for the high or low fuel pump circuit did not change when activated during Key On Engine Off Self-Test. Possible causes are: — Open or grounded fuel pump circuit — Open or grounded processor driver — Disconnected or open solenoid • Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Disconnect Integrated Controller. • DVOM on 200 ohm scale. For Service Code 87: • Measure resistance between Test Pin 22 at the breakout box and Pin 18 at the Integrated Controller vehicle harness connector. • Is resistance less than 5.0 ohms? For Service Code 83: • Measure resistance between Test Pin 41 at the breakout box and Pin 11 at the Integrated Controller vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to X16 . SERVICE open in fuel pump circuit. REMOVE breakout box. RECONNECT processor and controller. RERUN Quick Test.

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Pinpoint Test X

TEST STEP	RESULT	ACTION TO TAKE
X16 CHECK APPROPRIATE FUEL PUMP CIRCUIT FOR SHORTS TO POWER AND GROUND		
o Key off. o Breakout box installed, processor disconnected. o Integrated Controller disconnected. o DVOM on 200,000 ohm scale. For Service Code 87: o Measure resistance between Test Pin 22 and Test Pins 37, 57 and battery positive post and between Test Pin 22 and Test Pins 40, 60 and battery negative. For Service Code 83: o Measure resistance between Test Pin 41 and Test Pins 37, 57 and battery positive post and between Test Pin 41 and Test Pin 40, 60 and battery negative. o **Are all resistances greater than 10,000 ohms?**	Yes No	GO to X17. REMOVE breakout box. SERVICE the appropriate fuel pump circuit shorts to power or ground. RECONNECT all components. RERUN Quick Test. If code 87 or 83 is still present, GO to X17.
X17 CHECK RESISTANCE OF FUEL PUMP RELAY COIL		
o Key off. o Breakout box installed, processor disconnected. o Integrated Controller disconnected. o DVOM on 200 ohm scale. o Measure resistance of Integrated Controller from Pin 18 to 24 or from Pin 11 to 24 as appropriate. o **Is resistance between 65 and 100 ohms?**	Yes No	REMOVE breakout box. REPLACE processor. RECONNECT Integrated Controller. RERUN Quick Test. REMOVE breakout box. RECONNECT processor. REPLACE Integrated Controller. RERUN Quick Test.
X20 NO FAN (HIGH OR LOW)		
o Key off. o Disconnect Integrated Controller. o DVOM on 20 volt scale. o Measure voltage between battery negative post and Pins 1, 2, 6 and 7, (except 3.8L GO to pins 3 and 4) respectively at the Integrated Controller vehicle harness connector. o **Is voltage greater than 10.5 volts?**	Yes No	GO to X21. RECONNECT Integrated Controller. SERVICE open in battery power circuit. RE-EVALUATE symptom.

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Pinpoint Test X

TEST STEP	RESULT ▶	ACTION TO TAKE
X21 CHECK FAN MOTOR		
• Key off. • Integrated Controller disconnected. • Jumper Pin 3 to Pin 6 at Integrated Controller harness. • **Does fan run?**	Yes ▶ No ▶	GO to X22. GO to X23.
X22 CHECK FAN RUNNING MODE (LOW)		
• Key off. • Disconnect processor. • Reconnect Integrated Controller. • Key on. • **Does fan run at low speed?**	Yes ▶ No ▶	GO to X25. REPLACE Integrated Controller. RECONNECT processor and controller. RE-EVALUATE symptom.
X23 MEASURE BATTERY VOLTAGE SUPPLY AT FAN — BYPASSING INTEGRATED CONTROLLER		
• Key Off. • Disconnect cooling fan. • Integrated Controller disconnected. • Jumper Pin 3 to Pin 6 at Integrated Controller vehicle harness connector. • DVOM on 20 volt scale. • Measure voltage at cooling fan vehicle harness connector. • **Is voltage greater than 8.0 volts?**	Yes ▶ No ▶	RECONNECT Integrated Controller. REPLACE fan motor. RE-EVALUATE symptom. GO to X24.

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Pinpoint Test X

TEST STEP	RESULT ▶	ACTION TO TAKE
X24 VERIFY COOLING FAN GROUND		
• Key off. • Cooling fan disconnected. • Integrated Controller disconnected. • Jumper Pin 3 to Pin 6 at Integrated Controller vehicle harness connector. • DVOM on 20 volt scale. • Measure voltage between voltage positive at cooling fan harness connector and negative battery post. • **Is voltage greater than 8.0 volts?**	Yes ▶ No ▶	SERVICE Open in ground circuit to fan. RECONNECT Integrated Controller and cooling fan. RE-EVALUATE symptom. SERVICE open in power-to-fan circuit from 3 and 4 of Integrated Controller harness connector to cooling fan connector. RECONNECT cooling fan and controller, RE-EVALUATE symptom.
X25 JUMPER HIGH ELECTRIC-DRIVE SIGNAL (HEDF) TO GROUND		
• Key off. • Inspect processor 60 pin connector for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary • Install breakout box, leave processor disconnected. • Integrated Controller connected. • Key on. • Jumper Test Pin 52 to Test Pin 40 at breakout box. • **Does fan speed change from low to high?**	Yes ▶ No ▶	GO to X26 . REMOVE breakout box. REPLACE Integrated Controller. RECONNECT processor. RE-EVALUATE symptom.

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Pinpoint Test X

TEST STEP	RESULT ▶	ACTION TO TAKE
X26 CHECK ECT SENSOR		
• Key off, wait 10 seconds. • Breakout box installed. • Connect processor to breakout box. • Check engine coolant level. • Warm engine to operating temperature before taking ECT resistance measurement. • Key off, wait 10 seconds. • Disconnect harness from ECT sensor. • DVOM on 200,000 ohm scale. • Measure resistance of the ECT sensor. • **Is the resistance between 1500 ohms and 2000 ohms?**	Yes ▶ No ▶	For 3.8L SEFI SC, GO to X27. All others, REMOVE breakout box. REPLACE processor. RECONNECT harness to ECT sensor. RECONNECT Integrated Controllers. RE-EVALUATE symptom. REMOVE breakout box. REPLACE ECT sensor. RECONNECT all components. RE-EVALUATE symptom.
X27 CHECK A/C PRESSURE SWITCH HARNESS CONTINUITY		
• Key off. • Breakout box installed, processor connected. • Disconnect A/C pressure switch. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 2 at the breakout box and A/C pressure circuit at switch vehicle harness connector, also between Test Pin 46 at the breakout box and SIGNAL RETURN at the switch vehicle harness connector. • **Are both resistances less than 5 ohms?**	Yes ▶ No ▶	GO to X28. REMOVE breakout box. SERVICE open circuit. RECONNECT all components. RERUN Quick Test.
X28 VERIFY HEDF OPERATION		
• Key off. • A/C pressure switch disconnected. • Jumper A/C pressure circuit to SIGNAL RETURN at the switch vehicle harness connector. • Key on. • **Is HEDF on?**	Yes ▶ No ▶	REPLACE A/C PRESSURE switch. REMOVE breakout box. REPLACE processor. RERUN Quick Test.

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Pinpoint Test X

TEST STEP	RESULT ▶	ACTION TO TAKE
X30 SERVICE CODE 83: CHECK RESISTANCE OF HEDF CONTROLLER CIRCUIT		
o Service Code 83 indicates a High Electro Drive Fan (HEDF)/circuit failure. o Key off. o Disconnect Integrated Controller. o DVOM on 200 ohm scale. o Measure resistance between Pin 17 and Pin 24 at the Integrated Controller. o **Is the resistance reading between 50 ohms and 100 ohms?**	Yes ▶ No ▶	GO to X31 . REPLACE controller. RERUN Quick Test.
X31 CHECK HEDF PROCESSOR SIGNAL TO INTEGRATED CONTROLLER FOR OPEN		
o Key off. o Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. o Install breakout box, leave processor disconnected. o Integrated Controller disconnected. o DVOM On 200 ohms scale. o Measure resistance between Test Pin 52 at breakout box and Pin 17 of Integrated Controller vehicle harness connector. o **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to X32 . REMOVE breakout box. SERVICE open in HEDF circuit. RECONNECT all components. RERUN Quick Test.
X32 CHECK FOR SHORTS TO GROUND IN THE HEDF CIRCUIT		
o Key off. o Breakout box installed, processor disconnected. o Integrated Controller disconnected. o DVOM on 200,000 ohm scale. o Measure resistance between Test Pin 52 and Test Pin 40. o **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to X33 . REMOVE breakout box. RECONNECT processor and Integrated Controller. SERVICE short to ground in HEDF circuit. RERUN Quick Test.

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TEST STEP		RESULT ▶	ACTION TO TAKE
X33	CHECK FOR SHORTS TO POWER IN THE HEDF CIRCUIT		
	• Key off. • Breakout box installed, processor disconnected. • Integrated Controller disconnected. • DVOM on 200,000 ohms scale. • Measure resistance between Test Pin 52 and Test Pin 37. • **Is resistance greater than 10,000 ohms?**	Yes ▶	REMOVE breakout box. REPLACE Processor. RECONNECT all components. RERUN Quick Test.
		No ▶	REMOVE breakout box. SERVICE short to power. RECONNECT all components. RERUN Quick Test. If code 83 is still present, REPLACE processor. RERUN Quick Test.
X35	LOW SPEED FAN ALWAYS "ON"		
	• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires. Service as necessary. • Install breakout box, leave processor disconnected. • Disconnect the Integrated Controller. • DVOM on 200 ohm scale. • Measure the resistance between Test Pin 55 and controller vehicle harness Pin 14. • **Is resistance less than 5 ohms?**	Yes ▶	GO to X36.
		No ▶	REMOVE breakout box. SERVICE open in EDF circuit. RECONNECT all components. RE-EVALUATE symptom.
X36	CHECK EDF CIRCUIT FOR SHORTS TO POWER		
	• Key off. • Breakout box installed, processor disconnected. • Processor and Integrated Controller disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 55 and Test Pin 37 and between Test Pin 55 and battery positive post. • **Is resistance less than 10,000 ohms?**	Yes ▶	SERVICE short to power in EDF circuit. GO to X37.
		No ▶	GO to X37.

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TEST STEP	RESULT	ACTION TO TAKE
X37 CHECK EDF FOR SHORT TO GROUND		
• Key on. • Breakout box installed, processor disconnected. • Connect Integrated Controller. • Jumper Test Pin 55 to Test Pin 40 or 60. • **Does fan continue to run?**	Yes ▶	REMOVE breakout box. RECONNECT processor. REPLACE controller. RE-EVALUATE symptom.
	No ▶	REMOVE breakout box. RECONNECT controller. REPLACE processor. RE-EVALUATE symptom.
X38 CHECK A/C PRESSURE SWITCH INPUT		
• Key off. • Disconnect vehicle harness at the A/C pressure switch. • Key on. • **Does fan still run?**	Yes ▶	RECONNECT the vehicle harness connector to the A/C pressure switch. GO to X39 .
	No ▶	REPLACE the A/C pressure switch. RE-EVALUATE symptom.
X39 CHECK A/C PRESSURE SWITCH FOR SHORT TO GROUND		
• Key on. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires. Service as necessary. • Install breakout box, leave processor disconnected. • Disconnect Integrated Controller. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 2 and Test Pins 40, 46 and 60. • **Is resistance less than 10,000 ohms?**	Yes ▶	SERVICE short circuit. REMOVE breakout box. RECONNECT the processor and the integrated controller. RE-EVALUATE the symptom.
	No ▶	GO to X35 .

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Pinpoint Test X

TEST STEP		RESULT	ACTION TO TAKE
X40	CHECK FAN VOLTAGE		
	• Key off. • Disconnect Integrated Controller. • DVOM on 20 volt scale. • Measure voltage between battery negative post and Pin 1 and Pin 2, (except 3.8L GO to pins 3 and 4) respectively at the Integrated Controller vehicle harness connector. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to X41. RECONNECT controller. SERVICE open in battery power circuit. RE-EVALUATE symptom.
X41	CHECK FAN MOTOR		
	• Key off. • Integrated Controller disconnected. • Jumper Pin 1 to Pin 3 at Integrated Controller harness. • **Does fan run?**	Yes ▶ No ▶	GO to X42. GO to X43.
X42	CHECK FAN RUNNING MODE		
	• Key off. • Disconnect processor. • Connect Integrated Controller. • Key on. • **Does fan run?**	Yes ▶ No ▶	GO to X46. GO to X44.
X43	MEASURE BATTERY VOLTAGE SUPPLY AT FAN — BYPASSING INTEGRATED CONTROLLER		
	• Key off. • Disconnect cooling fan. • Integrated Controller disconnected. • Jumper Pin 1 to Pin 3 at Integrated Controller vehicle harness connector. • DVOM on 20 volt scale. • Measure voltage at cooling fan vehicle harness connector. • **Is voltage greater than 8.0 volts?**	Yes ▶ No ▶	RECONNECT all components. CHANGE fan. RE-EVALUATE symptom. GO to X45.

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Pinpoint Test X

TEST STEP	RESULT	ACTION TO TAKE
X44 CHECK EDF CIRCUIT FOR SHORT TO GROUND		
o Key off. o Processor and controller disconnected. o DVOM on 200,000 ohm scale. o Measure resistance from Pin 14 to Pin 15 at Integrated Controller vehicle harness connector. o **Is resistance greater than 10,000 ohms?**	Yes ▶	REPLACE Integrated Controller. RECONNECT processor and controller. RE-EVALUATE symptom.
	No ▶	SERVICE short to ground in EDF circuit. RECONNECT processor and Integrated Controller. RE-EVALUATE symptom.
X45 VERIFY COOLING FAN GROUND		
o Key off. o Cooling fan disconnected. o Integrated Controller disconnected. o Jumper Pin 1 to Pin 3 at Integrated Controller vehicle harness connector. o DVOM on 20 volt scale. o Measure voltage between voltage positive at cooling fan harness connector and negative battery post. o **Is voltage greater than 8.0 volts?**	Yes ▶	SERVICE open in ground circuit to fan. RECONNECT Integrated Controller, RE-EVALUATE symptom.
	No ▶	SERVICE open in power-to-fan circuit from 3 and 4 of Integrated Controller harness connector to cooling fan connector. RECONNECT controller. RE-EVALUATE symptom.
X46 CHECK ECT SENSOR		
o Reconnect processor. o Check engine coolant level. o Warm engine to operating temperature before taking ECT resistance measurement. o Key off, wait 10 seconds. o Harness disconnected from ECT sensor. o DVOM on 200,000 ohm scale. o Measure resistance of the ECT sensor. o **Is the resistance reading between 1500 ohms and 2000 ohms?**	Yes ▶	REPLACE processor. RECONNECT harness to ECT sensor. RECONNECT Integrated Controller. RE-EVALUATE symptom.
	No ▶	REPLACE ECT sensor. RECONNECT all components. RE-EVALUATE symptom.

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TEST STEP	RESULT ▶	ACTION TO TAKE
X50 CHECK FOR VOLTAGE AT A/C CLUTCH		
• Key on, engine off. • A/C demand switch to A/C ON position. • Start engine. • DVOM on 20 volt scale. • Check voltage at A/C clutch harness connector. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to Shop Manual, Group 36, A/C Diagnosis. GO to X51 .
X51 CHECK FOR CONTINUITY FROM INTEGRATED CONTROLLER TO A/C CLUTCH		
• Key off. • Disconnect Integrated Controller. • DVOM on 200 ohm scale. • Measure resistance between Pin 23 of the controller harness and power side of the A/C clutch harness connector and between Pin 16 of the controller harness and ground side of the A/C clutch harness connector. • **Are both resistances less than 5 ohms?**	Yes ▶ No ▶	GO to X52 . SERVICE open in power to A/C clutch or ground to A/C clutch. RE-EVALUATE symptom.
X52 ENTER OUTPUT STATE CHECK (REFER TO QUICK TEST APPENDIX)		
NOTE: Do not use STAR tester for this Step, use VOM/DVOM. • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • DVOM on 20 volt scale. • Connect DVOM negative test lead to STO and positive test lead to battery positive. • Jumper STI to SIGNAL RETURN. • Perform Key On Engine Off Self-Test until the completion of the Continuous Test Codes. • DVOM will indicate zero volts. • Depress and release the throttle. • **Did DVOM reading change to a high voltage reading?**	Yes ▶ No ▶	REMAIN in Output State Check. GO to X53 . DEPRESS throttle to WOT and RELEASE. If STO voltage does not go high, GO to Pinpoint Test Step QC1 . LEAVE equipment hooked up.

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Pinpoint Test X

TEST STEP		RESULT	ACTION TO TAKE
X53	CHECK WAC OUTPUT FOR PROPER ELECTRICAL OPERATION		
	o Key on, engine off. o A/C demand switch to A/C on position. o Breakout box installed, processor connected. o DVOM on 20 volt scale. o Connect DVOM positive test lead to Test Pin 37 and negative test lead to Test Pin 54. o While observing DVOM, depress and release the throttle several times. o **Does voltage output change?**	Yes ▶ No ▶	GO to X54. GO to X57.
X54	CHECK FOR VOLTAGE AT A/C CLUTCH SWITCH		
	o Key on, engine off. o A/C demand switch to A/C on position. o DVOM on 20 volt scale. o Breakout box installed, processor connected. o Integrated Controller connected. o Measure voltage between Test Pin 10 and Test Pin 40 at breakout box. o **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to X55. GO to X56.
X55	CHECK CONTINUITY OF ACCS TO INTEGRATED CONTROLLER		
	o Key off, wait 10 seconds. o Breakout box installed. o Processor disconnected. o Integrated Controller disconnected. o DVOM on 200 ohm scale. o Measure resistance between Test Pin 10 at breakout box and Pin 21 at controller harness connector. o **Is resistance less than 5 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT processor. REPLACE Integrated Controller. RE-EVALUATE symptom. REMOVE breakout box. RECONNECT all components. SERVICE open in ACCS circuit. RE-EVALUATE symptom.

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TEST STEP	RESULT ▶	ACTION TO TAKE
X56 CHECK CONTINUITY OF ACCS CIRCUIT		
• Key off, wait 10 seconds. • Breakout box installed, processor connected. • A/C demand switch to A/C ON position. • Integrated Controller connected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 10 and A/C demand switch. • **Is resistance less than 5 ohms?**	No ▶	SERVICE open in circuit. RERUN Quick Test. REMOVE breakout box. RECONNECT all components.
	Yes ▶	EEC-IV system OK. REFER to Shop Manual, Group 36 A/C Diagnosis. REMOVE breakout box. RECONNECT all components.
X57 CHECK CONTINUITY IN WAC TO INTEGRATED CONTROLLER CIRCUIT		
• Key off, wait 10 seconds. • Breakout box installed. • Disconnect processor. • Disconnect Integrated Controller. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 54 and Pin 22 at Integrated Controller harness. • **Is resistance less than 50 ohms?**	No ▶	REMOVE breakout box. RECONNECT all components. SERVICE open in WAC circuit. RE-EVALUATE symptom.
	Yes ▶	GO to X58 .
X58 CHECK WAC CIRCUIT FOR SHORTS TO GROUND		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • Integrated Controller disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 54 and Test Pin 40 and between Test Pin 54 and Test Pin 46 and between Test Pin 54 and battery negative post. • **Are all resistances greater than 10,000 ohms?**	Yes ▶	GO to X59 .
	No ▶	REMOVE breakout box. RECONNECT all components. SERVICE shorts to ground in WAC circuit. RE-EVALUATE symptom.

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Pinpoint Test X

TEST STEP		RESULT	ACTION TO TAKE
X59	CHECK WAC CIRCUIT FOR SHORTS TO POWER		
	∘ Key off, wait 10 seconds. ∘ Breakout box installed, processor disconnected. ∘ Integrated Controller disconnected. ∘ DVOM on 200,000 ohm scale. ∘ Measure resistance between Test Pin 54 and Test Pin 37 and between Test Pin 54 and battery positive. ∘ **Are both resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to X60. REMOVE breakout box. RECONNECT all components. SERVICE short to power in WAC circuit. GO to X60.
X60	CHECK FOR VOLTAGE AT A/C CLUTCH		
	∘ Key off, wait 10 seconds. ∘ Breakout box installed, processor disconnected. ∘ Connect Integrated Controller. ∘ A/C clutch disconnected. ∘ A/C demand switch to A/C ON position. ∘ Key on, engine off. ∘ DVOM on 20 volt scale. ∘ Measure voltage at A/C clutch harness connection. ∘ **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT all components. REPLACE processor. RE-EVALUATE symptom. REMOVE breakout box. RECONNECT all components. REPLACE Integrated Controller. RE-EVALUATE symptom.
X80	SERVICE CODE 88: CHECK EDF PROCESSOR SIGNAL TO INTEGRATED CONTROLLER FOR SHORTS TO GROUND		
	NOTE: If fan is always on with Code 88, GO to X82. ∘ Key off. ∘ Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, and loose wires, etc. Service as necessary. ∘ Install breakout box, leave processor disconnected. ∘ Disconnect Integrated controller. ∘ DVOM on 200,000 ohm scale. ∘ Measure resistance between Test Pin 55 and Test Pin 40. ∘ **Is resistance less than 10,000 ohms?**	Yes ▶ No ▶	SERVICE short to ground in EDF circuit. RECONNECT all components. RERUN Quick Test. GO to X81.

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Pinpoint Test X

TEST STEP	RESULT ▶	ACTION TO TAKE
X81 CHECK FAN RUNNING MODE		
• Key off. • Breakout box installed, processor disconnected. • Connect integrated controller. • Key on, engine off. **For 2.5L MTX ▶ Does fan run?** **For 2.5L, 3.0L and 3.8L AXOD ▶ Does fan run at low speed?**	Yes ▶	REMOVE breakout box. REPLACE processor. RECONNECT all components. RERUN Quick Test.
	No ▶	REMOVE breakout box. REPLACE Integrated Controller. RECONNECT all components. RERUN Quick Test.
X82 FAN ALWAYS ON WITH CODE 88: CHECK EDF PROCESSOR SIGNAL TO INTEGRATED CONTROLLER FOR OPEN CIRCUIT		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, and loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Disconnect Integrated Controller. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 55 and Integrated Controller harness Pin 14. • **Is resistance less than 5 ohms?**	Yes ▶	GO to X83.
	No ▶	REMOVE breakout box. SERVICE open in EDF circuit. RECONNECT all components. RERUN Quick Test.
X83 CHECK EDF CIRCUIT FOR SHORTS TO POWER		
• Key off. • Breakout box installed, processor disconnected. • Integrated controller disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 55 and Test Pin 37, and between Test Pin 55 and battery positive. • **Is resistance less than 10,000 ohms?**	Yes ▶	SERVICE short to power in EDF circuit, then GO to X84.
	No ▶	GO to X84.

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TEST STEP	RESULT ▶	ACTION TO TAKE
X84 CHECK EDF SHORT TO GROUND		
o Key off. o Breakout box installed, processor disconnected. o Integrated controller connected. o Key on, engine off. o Jumper test Pin 55 to Test Pin 40 or 60. o **Does fan continue to run?**	Yes ▶	REMOVE breakout box. REPLACE Integrated Controller. RECONNECT all components. RERUN Quick Test.
	No ▶	REMOVE breakout box. REPLACE processor. RECONNECT all components. RERUN Quick Test.
X90 SERVICE CODE 95: CHECK INERTIA SWITCH		
Key On Engine Off Service Code 95 indicates that one of the following has occurred: — Open circuit in/or between the fuel pump and FPM circuit (see schematic) — Poor fuel pump ground — FUEL PUMP circuit short to power — Fuel pump relay contacts always closed o Key off, wait 10 seconds. o Locate and disconnect fuel pump inertia switch. o DVOM on 200 ohm scale. o Measure resistance of the fuel pump inertia switch. o **Is resistance less than 5.0 ohms?**	Yes ▶	RECONNECT inertia switch. GO to X91.
	No ▶	REPLACE or RESET inertia switch. RERUN Quick Test.
X91 VERIFY THAT FUEL PUMP IS OFF		
o Key off. o Listen for motor noise from fuel pump. o **Is fuel pump off?**	Yes ▶	GO to X93.
	No ▶	GO to X92.

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Integrated Controller

Pinpoint Test X

TEST STEP		RESULT ▶	ACTION TO TAKE
X92	CHECK FOR FUEL PUMP RELAY ALWAYS CLOSED		
	• Key off. • Locate and disconnect integrated controller. • **Does fuel pump shut off when controller is disconnected?**	Yes ▶	REPLACE Integrated Controller. RERUN Quick Test
		No ▶	SERVICE short to power in POWER-TO-PUMP/FPM circuit. RECONNECT integrated controller. RERUN Quick Test.
X93	CHECK CONTINUITY OF FPM CIRCUIT		
	• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Disconnect integrated controller. • DVOM on 200 ohm scale. • Measure resistance between FPM circuit at the breakout box and integrated controller harness connector pin 5. • **Is resistance less than 5.0 ohms?**	Yes ▶	GO to X94 .
		No ▶	REMOVE breakout box. RECONNECT processor and integrated controller. SERVICE open circuit. RERUN Quick Test.
X94	CHECK FOR CONTINUITY BETWEEN FPM CIRCUIT AND GROUND		
	• Key off. • Breakout box installed, processor disconnected. • Integrated controller disconnected. • DVOM on 200 ohm scale. • Measure resistance between FPM circuit at the breakout box and battery negative post. • **Is resistance less than 5.0 ohms?**	Yes ▶	REMOVE breakout box. RECONNECT integrated controller. REPLACE processor. RERUN Quick Test.
		No ▶	REMOVE breakout box. RECONNECT processor and integrated controller. GO to Shop Manual Group 24, Electric Fuel Pump for open in POWER-TO-PUMP circuit, poor fuel pump ground, open in fuel pump, etc.

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Integrated Controller

Pinpoint Test X

TEST STEP		RESULT ▶	ACTION TO TAKE
X95	SERVICE CODE 59 OR 96: CHECK CONTINUITY OF POWER-TO-PUMP CIRCUIT		
	NOTE: Service Code 59 or 96 indicates that when the fuel pump is being activated, power is not being supplied to the fuel pump. o Key off, wait 10 seconds. o Disconnect processor 60 pin connector. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. o Install breakout box, leave processor disconnected. o Disconnect integrated relay controller. o DVOM on 200 ohm scale. o Measure resistance between the FPM circuit at the breakout box and integrated controller harness connector pin 5. o **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to X96. REMOVE breakout box. RECONNECT processor and integrated controller. SERVICE open in POWER-TO-PUMP circuit between FPM splice and the integrated controller. RERUN Quick Test.
X96	VERIFY FUEL PUMP OPERATION		
	o Key off. o Breakout box installed. o Connect processor to breakout box. o Connect Integrated Controller. o DVOM on 20 volt scale. o Connect DVOM between FPM circuit and Test Pin 40 at the breakout box. o While observing DVOM, turn key to on. o **Does voltage increase to greater than 10.5 volts for about 1 second after key is turned to on?**	Yes ▶ No ▶	REMOVE breakout box. REPLACE processor. RERUN Quick Test. REMOVE breakout box. RECONNECT processor. REPLACE integrated controller. RERUN Quick Test.

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Integrated Controller

Pinpoint Test X

TEST STEP	RESULT ▶	ACTION TO TAKE
X100 CONTINUOUS MEMORY CODE 95: CHECK EEC-IV HARNESS		
A Continuous Memory Code 95 indicates that one of the following intermittent conditions has occurred: — Open circuit in or between the fuel pump and FPM circuit in the processor (see schematic [X]). — Poor fuel pump ground. • Start engine. • Check for engine stall/stumble while performing the following (also, if possible, listen for fuel pump turning off). — Shake, wiggle, bend the power-to-pump circuit between the Integrated Controller pin 5 and the fuel pump. — Shake, wiggle, bend the fuel pump ground circuit from the fuel pump to ground. — Lightly tap the inertia switch and the fuel pump to simulate road shock. • Key off. • Inspect the fuel pump electrical connector and the fuel pump ground for corrosion, damaged pins, etc. • **Is fault indicated/found?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory Code 95. REFER to Quick Test Appendix. RERUN Quick Test. GO to [X101] .
X101 CHECK FPM CIRCUIT		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Key on, engine off. • Connect a test lamp between FPM circuit and Test Pin 37. • Observe test lamp for an indication of a fault while performing the following (The light will go out when a fault is found indicating an open): — Shake, wiggle, bend the fuel pump monitor circuit (Pin 8) between the processor and splice into the POWER-TO-PUMP circuit. • **Is fault found/indicated?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. REMOVE breakout box. CLEAR Continuous Memory Code 95. REFER to Quick Test Appendix. RERUN Quick Test. Unable to duplicate fault at this time. CLEAR Continuous Memory Code 95. REFER to Quick Test Appendix.

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Integrated Controller | Pinpoint Test | X

TEST STEP		RESULT ▶	ACTION TO TAKE
X102	CONTINUOUS MEMORY CODE 59 or 96 CHECK FOR CONTINUOUS MEMORY CODE 83 or 87		
	o **Is Continuous Memory Code 83 or 87 also present?**	Yes ▶ No ▶	GO to X104. GO to X103.
X103	CHECK EEC-IV HARNESS		
	A Continuous Memory Code 59 or 96, without the presence of a Continuous Memory Code 83 or 87, indicates that during vehicle operation, one of the following has occurred: — Fuel pump relay contacts opened. — Open in the POWER-TO-PUMP circuit from the integrated relay controller pin 5 to the FPM splice. (See schematic X). o Start engine. o Check for engine stall/stumble while performing the following (also, if possible, listen for fuel pump turning off): — Shake, wiggle, bend the POWER-TO-PUMP circuit from the integrated relay controller to the FPM splice. — Lightly tap the integrated relay controller (to simulate road shock). o Key off. o Inspect the integrated relay controller 24 pin connectors for corrosion, damaged pins, etc. o **Is fault indicated/found?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory Code. REFER to Quick Test Appendix. RERUN Quick Test. Unable to duplicate fault at this time. CLEAR Continuous Memory Code 59 or 96. REFER to Quick Test Appendix. Continuous Memory Code 59 or 96 testing complete.

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Integrated Controller

Pinpoint Test X

TEST STEP	RESULT ▶	ACTION TO TAKE
X104 CONTINUOUS MEMORY CODE 83 or 87: CHECK EEC-IV HARNESS		
A Continuous Memory Code 83 or 87 indicates that one of the following intermittent conditions has occurred: — Open VPWP circuit in the integrated relay controller. — Open coil in fuel pump relay. — Open in fuel pump primary circuit. • Start engine. • Check for engine stall/stumble while performing the following (also, if possible, listen for fuel pump turning off): — Shake, wiggle, bend the EEC-IV Harness fuel pump circuit (pin 22) between the processor and the Integrated Controller (pin 18). or: — Shake, wiggle, bend the EEC-IV harness fuel pump circuit (Pin 41) between the processor and the Integrated Controller (Pin 11). — Lightly tap the Integrated Controller (to simulate road shock). • Key off. • Inspect the processor 60 pin connectors and the integrated relay controller 24 pin connectors for corrosion, damaged pins, etc. • **Is fault indicated/found?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory Service Code(s). REFER to Quick Test Appendix. RERUN Quick Test. Unable to duplicate fault at this time. CLEAR Continuous Memory Code(s). REFER to Quick Test Appendix.

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PART III — DIESEL ENGINES

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SECTION 18

EEC-IV Monitor Box: Intermittent Fault Diagnostics

PREVIEW

This Section supports diagnostic procedures and data when using the EEC-IV Monitor and EEC-IV Monitor Recorder equipment. The focus of this Section is solving drive-ability concerns which are intermittent or which reveal no hard codes (KOEO or KOER). The procedure used to find the EEC-IV fault is based upon identifying the symptom (Symptom Chart) and recreating it (Road Test) to troubleshoot the fault. Features of this Section include the following:

- Symptom Charts with non-EEC causes and EEC-IV suspect components listed in a prioritized order
- Support for Continuous Memory Codes which may be present
- Strategies for Analyzing Road Test Data
- Installation, description and use of EEC-IV Monitor and EEC-IV Monitor Recorder
- Diagnostic Reference Value Sheets for each engine listing EEC-IV component measurements at KOEO, Hot Idle, 30 mph and 55 mph
- EEC-IV charts and graphs for EEC-IV Monitor measurements

Section 18 — EEC-IV Monitor Box: Intermittent Fault Diagnostics is available through Ford Motor Co. at the following address:

Ford Motor Co.
Rm 2009
3000 Schaeffer Rd.
Dearborn, MI. 48121

Please remit $25.00 per copy

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ENGINE/EMISSIONS DIAGNOSIS

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SECTION 19

Diesel Diagnostics — 6.6L and 7.8L Ford Diesel Engines

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Preliminary Checkout

This Section covers Adjustments, Diagnosis, and Test procedures for the 6.6L and 7.8L Ford Diesel engines. The areas included are the low-pressure fuel system, high-pressure (fuel injection) fuel system, air induction system, turbocharger, lubrication and cooling systems.

Before Starting

Efficient diagnosis must take place in an organized manner with a plan or procedure which starts with the obvious and goes on to the more difficult. Eliminate all the obvious and easy-to-do items first. Do not start by jumping to conclusions. The job worked on last week might have been caused by an entirely different problem than the one today.

Get All The Information Available

Check out all sources of information. Talk to the operator. Sometimes asking a question will cause the operator to remember something that is useful.

The following list is a set of basic questions. Get the answers to these in order to learn what the true complaint is, and what the basic problem is.

Operating Conditions:

1. Did the problem occur suddenly or over a long period of time?
2. Were there any abnormal noises before the failure?
3. Was the engine under heavy or light load? Decelerating or accelerating?
4. Did the water temperature or oil pressure vary?
5. Were weather conditions a factor?
6. What type of road grade was the vehicle on when the trouble was first noticed?
7. How was the trouble first noticed (felt, heard, etc.)?
8. What was the amount of oil consumption? Fuel? Coolant? Had there been a recent change?
9. What was the exhaust smoke like? Light or dense? Color?
10. Does the engine have good throttle response?
11. Is deceleration normal?
12. Does the engine shut off properly?
13. Does the engine start correctly when cold?
14. Does the engine ever miss?
15. What kind of fuel is being used? Grade and source?
16. Does the engine surge at idle or wide-open throttle?
17. Is the engine subjected to periods of extended idling?
18. Has the vehicle or equipment been in an accident or collision?

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Preliminary Checkout

Maintenance History:

1. Has the engine been serviced recently? What was done?
2. Has this complaint occurred before? If so, what was done then?
3. When was the last tune-up?
4. When were the oil and fuel filters last changed?
5. Who normally performs the maintenance and adjustments?
6. Is the maintenance schedule followed closely?
7. How is fuel obtained and stored?
8. What type service designation (SG/CE), and what grade oil is used?
9. How many miles or hours has the engine operated since the last service?

Observed Information:

1. Is the engine clean or dirty?
2. Are the belts in good condition? Loose?
3. Is there evidence of external oil, coolant or fuel leaks?
4. Does the engine appear to have overheated?
5. Are there any make-shift repairs on the engine (loose parts, wired-on parts, etc.)?
6. How does the engine sound at idle?
7. Are any pulleys wobbling?
8. Do any parts appear to have been altered or serviced recently?
9. Are there any aftermarket or unapproved parts on the engine?
10. Have any of the lines been altered or re-routed?
11. Are oil level, coolant level and fuel level satisfactory? (If the problem concerns bearings, notice the condition of the oil.)
12. During disassembly, does the engine have unusual odors, carbon accumulations, dirt or other conditions under the rocker cover?

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Test Equipment

The following test equipment (Figures 1 through 4) is required for adjusting idle speed and timing.

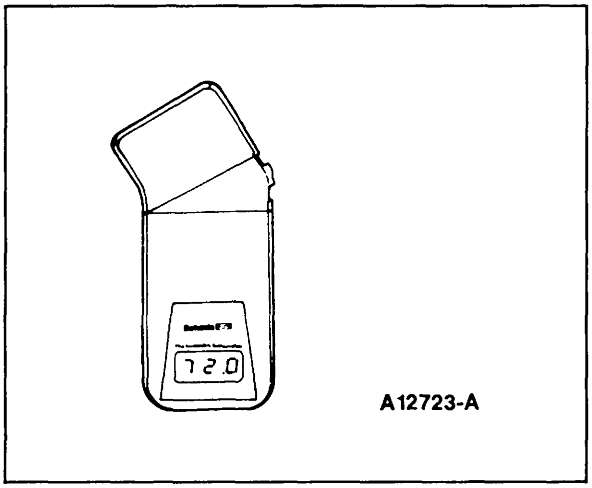

Figure 1 Photoelectric Tachometer, Rotunda 055-00108 Checking Engine

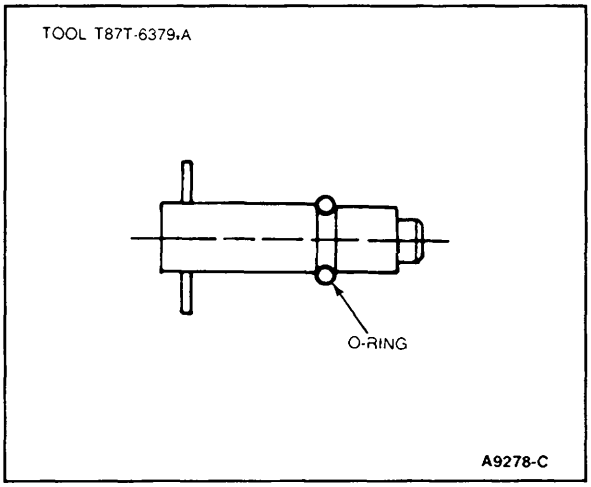

Figure 3 Timing Lock Pin — Damper T87T-6379-A

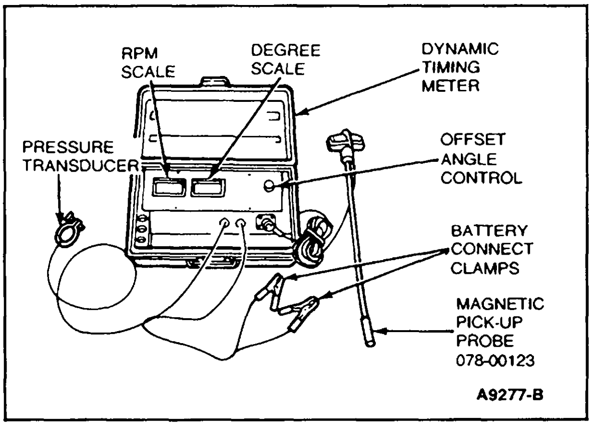

Figure 2 Dynamic Timing Meter, Rotunda 078-00200

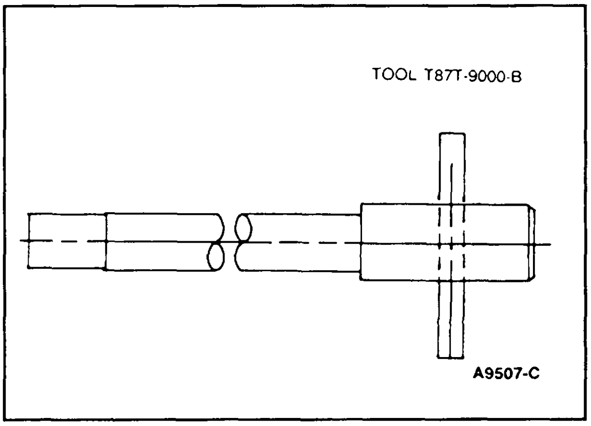

Figure 4 Timing Lock Pin — Injector Pump T87T-9000-B

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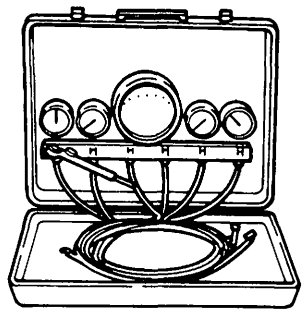
Test Equipment

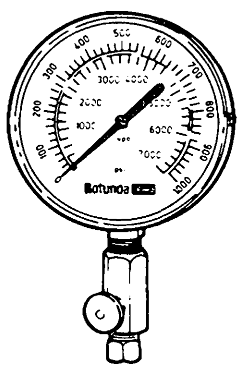
The following test equipment (Figure 5) is required for performing the Engine Performance Diagnostic procedure.



A8554-B

Figure 5 Rotunda 014-00762 Pressure Test Kit Used with Rotunda Adapter Kit 014-00733, 014-00742

The following test equipment (Figure 6) is used to test engine compression.



A9281-B

Figure 6 Rotunda Compression Tester 014-00701 Requires Adapter 014-00731

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Test Equipment

The following test equipment (Figure 7) is required for injection nozzle testing and cleaning.

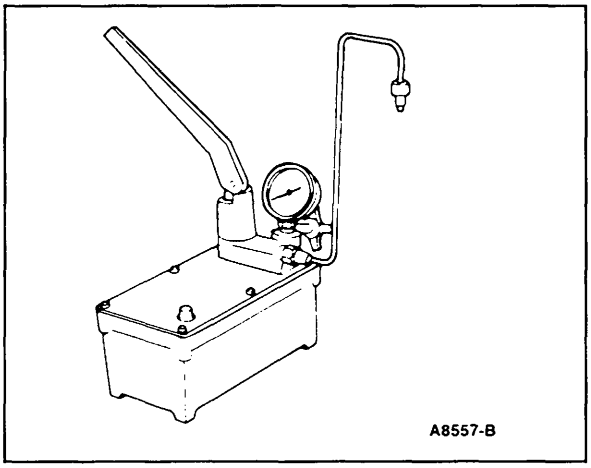

Figure 7 Rotunda Injector Nozzle Tester 014-00300 (Special Service Tool D83T-9000-F)

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1989 Ford Diesel
Engine Performance Specifications

	6.6L Turbo				7.8L Turbo					
	165	165	170	185	185	210	215	215	240	270
Engine Model	49	Calif.	50	50	49	50	49	Calif.	50	50
Engine Rating (BHP' @ 2400 rpm)				185	185	210	215	215	240	270
Engine Rating (BHP @ 2600 rpm)	165	165	170							
Firing Order	1-5-3-6-2-4									
Injection Pump Make and Model — Robert Bosch	A-2000		P-3000	A-2000	P-3000	P-3000	P-3000	P-3000	P-3000	
Turbocharger Make and Model — Garret Airesearch	T04E									T45
Injection Nozzle Make	Robert Bosch									
Injection Nozzle Opening Pressure (New) — PSI	3100-3220		3680-3800	3100-3220	3680-3800					
Minimum Allowable Opening Pressure (Used-Service Check) — PSI	2870		3390	2870	3390					
Injection Pump Static Timing — BTDC	20°	14°	10°	14°	16°	10°	17°	10°	11°	12°
Injection Pump Dynamic Timing — (No Load) @ 1000 rpm	①		①	①	①	①	①	①	①	①
Low Idle Speed — Man. and Auto. Transmission	700-750									
High Idle Speed	2930-3010		2960-3040	2740-2820	2740-2820	2740-2820	2740-2820	2740-2820	2760-2840	2780-2840
Intake and Exhaust Valve Clearance (cold) — Intake	0.015 in (0.38mm)				0.015 in (0.38mm)					
Intake and Exhaust Valve Clearance (cold) — Exhaust	0.018 in (0.046mm)				0.018 in (0.46mm)					
Intake Manifold (Turbo Boost) Pressure — Full Load @ rated rpm	16 ± 1 psi (110 ± 7 kPa) @ 2600 rpm	18 ± 1 psi (127 ± 7 kPa) @ 2600 rpm	20 ± 1 psi (103 ± 7 kPa) @ 2600 rpm	18 ± 1 psi (127 ± 7 kPa) @ 2400 rpm	12 ± 1 psi (103 ± 7 kPa) @ 2400 rpm	17 ± 1 psi (138 ± 7 kPa) @ 2400 rpm	11 ± 1 psi (75 ± 7 kPa) @ 2400 rpm	14 ± 1 psi (110 ± 7 kPa) @ 2400 rpm	16 ± 1 psi (124 ± 7 kPa) @ 2400 rpm	22.6 ± 1 psi (156 ± 7 kPa) @ 2400 rpm
Crankcase Pressure (max. allowable), no load	3 in. H_2O (.7 kPa) @ 2600 rpm			3 in. H_2O (.7 kPa) @ 2400 rpm						
Air Filter Restriction @ rated rpm, no load	@ 2600 rpm			@ 2400 rpm						
	(Max) 10 in H_2O (2.5 kPa)									
Fuel Pressure (filter inlet)	(Min) 15 psi (103.43 kPa) (Max) 30 psi (206.85 kPa)									
Fuel Pressure (filter outlet)	(Min) 15 psi (103.43 kPa) (Max) 28 psi (193.06 kPa)									
Pressure Drop Across Fuel Filter	(Max) 7 psi (48.27 kPa)									
Lift Pump Suction @ rated rpm, no load	(Max) 10 in H_2O (2.5 kPa)									
Fuel Return Line Pressure — no load	(Max) 6 psi (41.37 kPa)									
Lubricating Oil Pressure at Operating Temperature	Low Idle: (Min) 15 psi (103 kPa)									
	High Idle: 65-95 psi (488-655 kPa)									

① Not available at time of publication.

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Engine Lubrication System

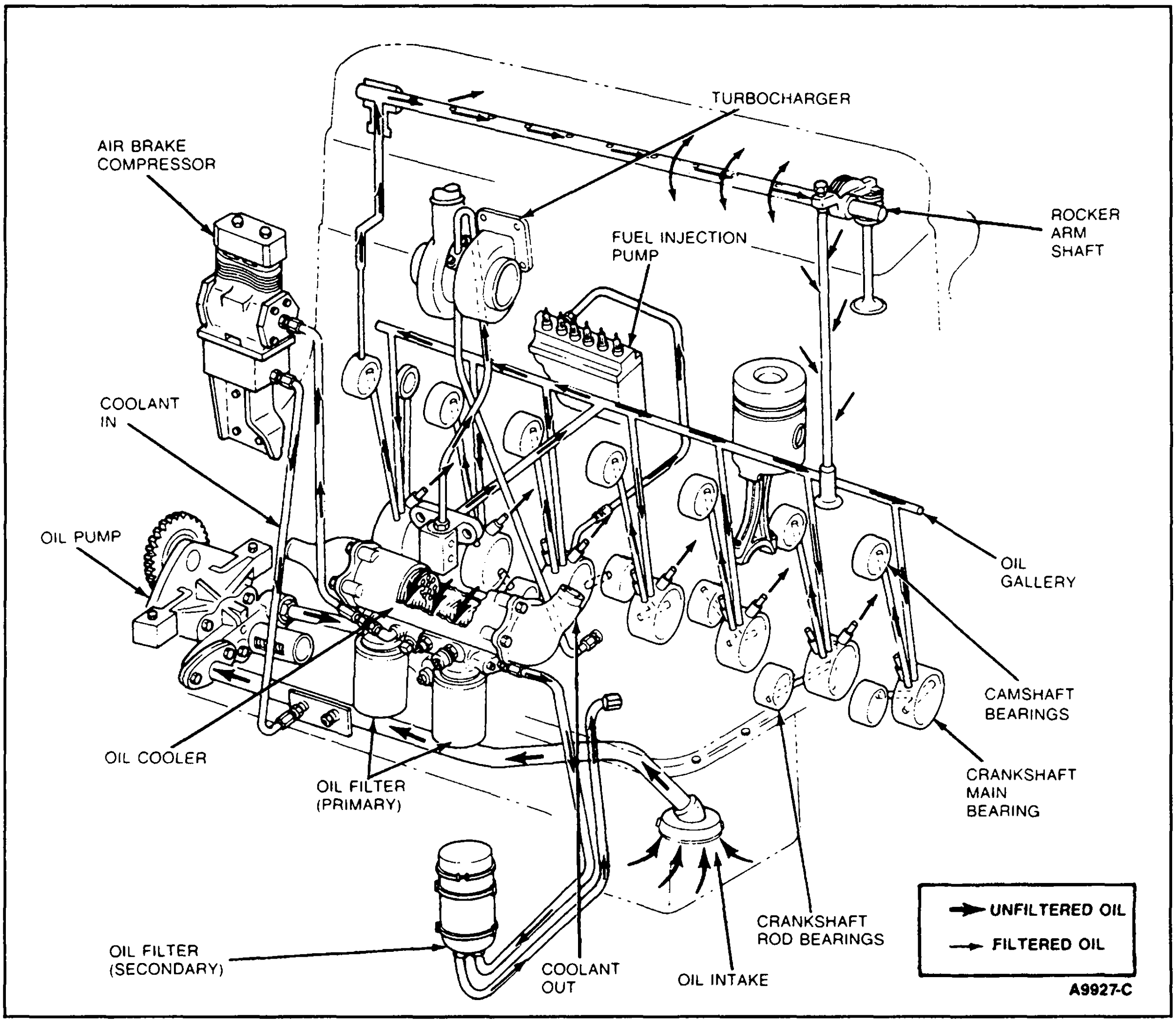

Figure 8 6.6L and 7.8L Ford Diesel Lubrication System

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Engine Lubrication System

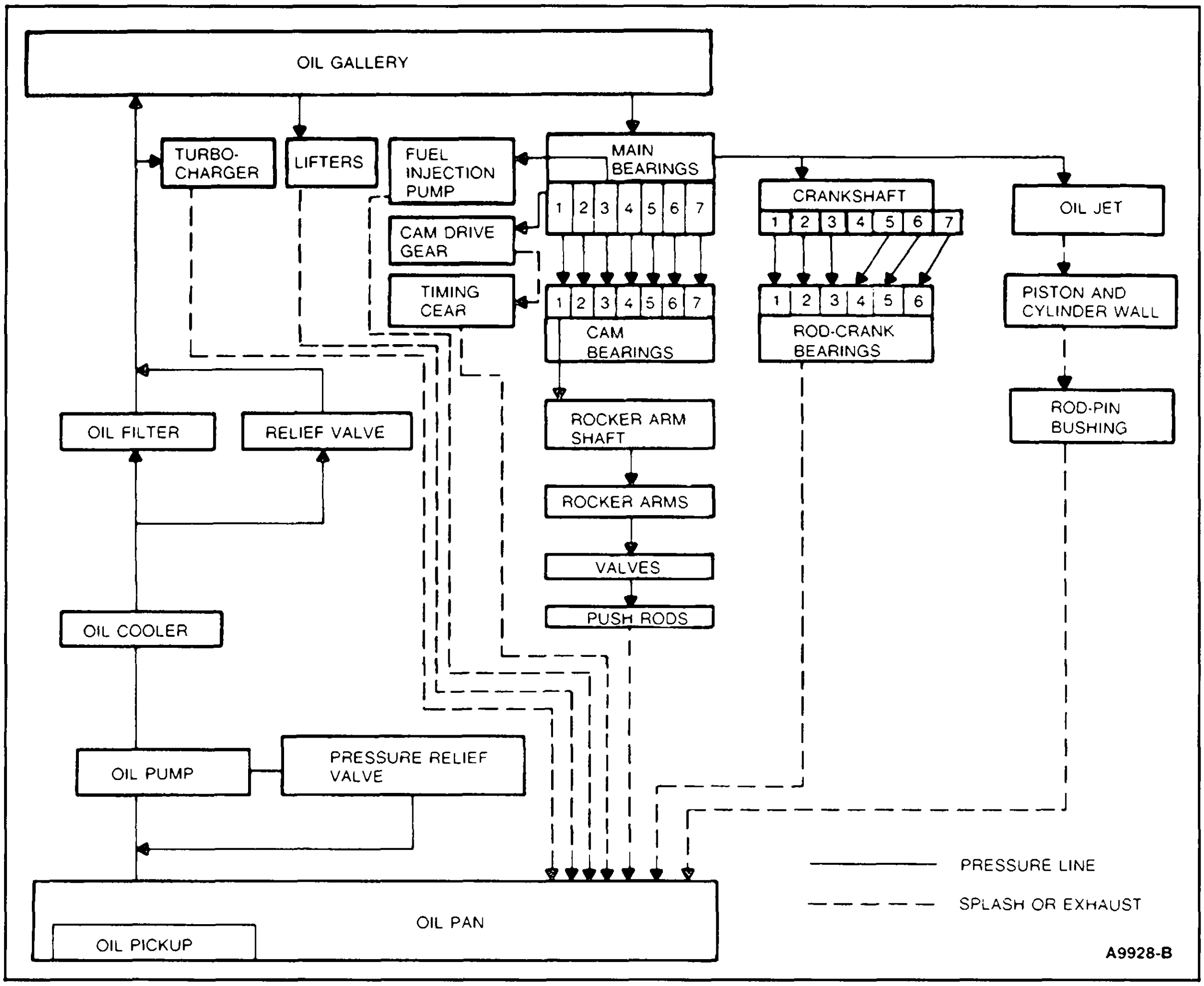

Figure 9 6.6L and 7.8L Ford Diesel Engines

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High and Low Idle Speed Check and Adjustment

1. Clean crankshaft vibration damper and apply reflective tape at point shown in Figure 10.

NOTE: If dynamic timing meter is being used to check engine rpm, application of reflective tape on vibration damper is not necessary. Refer to Dynamic Timing for instructions on meter hookup.

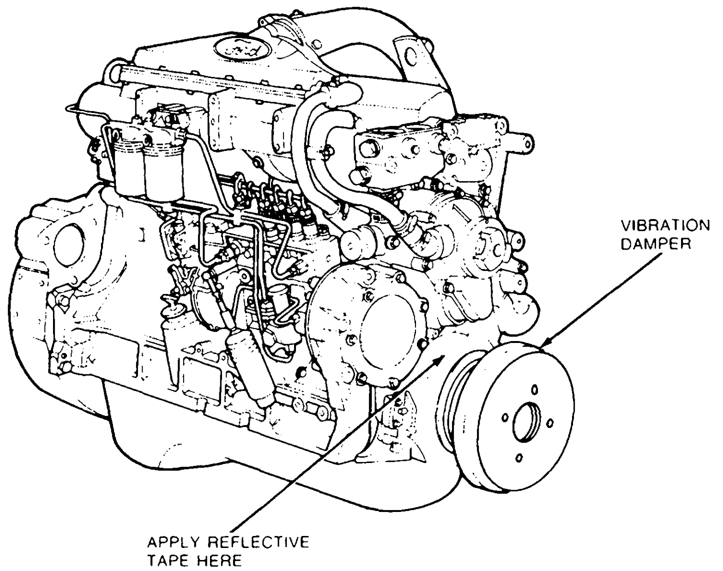

Figure 10 Reflective Tape Application

2. Place transmission in NEUTRAL or PARK and set the parking brake.
3. Bring engine to normal operating temperature. The engine must have been running at least 10 minutes prior to any adjustment.
4. Low idle speed is measured with manual transmission in NEUTRAL and automatic transmission in PARK.
5. Ensure that the throttle lever is against the low idle stop. If not, adjust linkage. Refer to Shop Manual, Section 25-60.

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High and Low Idle Speed Check and Adjustment

6. Check idle speed using Rotunda Photoelectric Tachometer 055-00108 or equivalent. Low idle speed is specified on the Vehicle Emission Control Information (VECI) decal. Turn adjusting screw (Figure 11) counterclockwise to increase speed, clockwise to decrease speed.

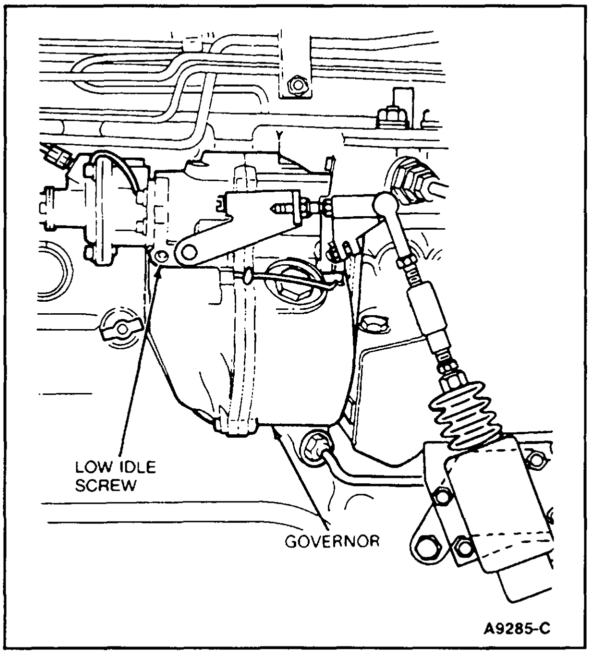

Figure 11 Adjusting Screw

7. Place transmission in NEUTRAL or PARK. Rev engine momentarily. Place transmission in specified gear (automatic transmission only) and recheck curb idle rpm. Adjust if necessary.
8. High idle speed is measured with manual transmission in NEUTRAL and automatic transmission in PARK or NEUTRAL.
9. Ensure that the throttle lever is against the high idle stop when the accelerator pedal is fully depressed. If not, adjust the linkage. Refer to Shop Manual, Section 25-60.
10. Check high idle speed using Rotunda Photoelectric Tachometer 055-00108 or equivalent.
11. If high idle speed is not correct, determine the problem. If the high idle is too low, go to the Engine Performance Diagnosis procedure. If the engine is overspeeding, the fuel injection pump should be sent to an authorized service center for inspection and diagnosis.

CAUTION

High idle speed is not to be adjusted. Breaking the seal on the high idle stop screw will void the warranty.

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Dynamic Timing

Engine timing is verified by using the timing bracket (Figure 12) located beside the crankshaft damper. The timing bracket contains holes for checking dynamic timing and static timing. Positioning of the bracket is very important because if it is loosened or moved, timing will not be correct. The bracket is accurately positioned and chisel marked to the front cover during engine production. These chisel marks must always be aligned. Never loosen or remove the timing bracket.

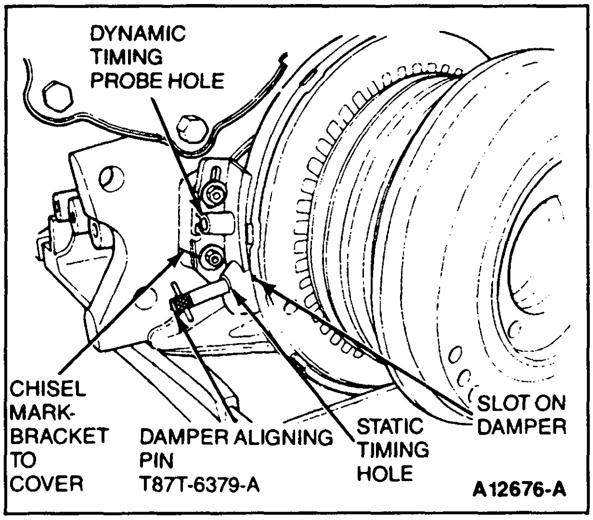

Figure 12 Timing Pin and Probe Bracket

Dynamic timing is used as a quick check of timing. Do not, under any circumstances, change or set engine timing based only on dynamic timing readings. Timing is to be verified and reset only with the Timing Lock Pins T87T-9000-B and T87T-6379-A or equivalent using the static timing method.

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Dynamic Timing

1. With engine stopped, install Rotunda Dynamic Timing Meter 078-00200 or equivalent. Place the magnetic pickup into the timing bracket pointer hole (Figure 13). Attach the connector from the pickup to the meter lead.

   NOTE: To prevent incorrect readings, make sure that the vibration damper grooves are clean and free of debris and rust. The pickup groove in the damper must not be plugged, or readings will be inaccurate.

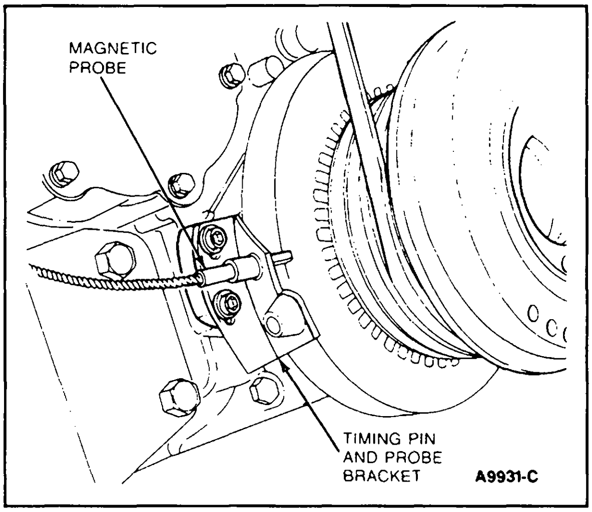

Figure 13 Inserting Magnetic Pickup Into Timing Bracket

2. Attach the pressure transducer to the No. 1 injector line (Figure 14) at the injector. Be sure the injector line is clean and free of paint where transducer is attached. Tighten the thumbscrew on the transducer finger-tight when attaching to the injector line.

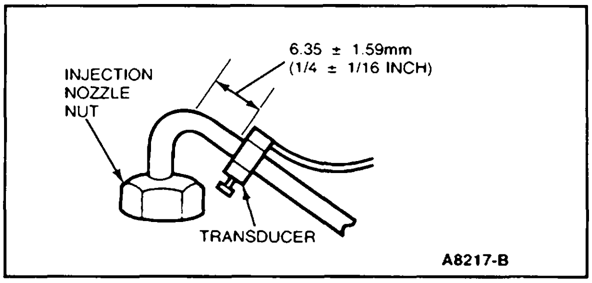

Figure 14 Pressure Transducer Attachment

NOTE: Cracks or other damage to the pressure transducer can cause incorrect timing readings. Follow these procedures carefully when working with pressure transducers.

- Do not over-tighten the transducer; snug fit is all that is needed. Do not use hand tools to tighten.
- Attach the transducer at the same location along the high-pressure line each time a check is made. The timing reading will change if the transducer is placed at a different location along the injector line.

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Dynamic Timing

- The transducer should be dry; wet conditions will give erratic readings. If erratic readings are observed, remove transducer, wipe line and transducer with a clean, dry cloth. Spray the transducer and line with a water-displacing material, and clamp on the injector line.

3. Connect the timing meter to the battery and adjust the offset angle on the meter to zero degrees.

CAUTION

Be sure that all wire leads are located away from the front accessory drive belts and cooling fan.

4. With the transmission in NEUTRAL or PARK and the parking brake set, start the engine. Set the engine speed at 1000 rpm with no load, and observe the timing meter.
5. Check the Engine Performance Specifications for the correct timing specification for the engine being serviced and compare with observed reading.
6. Turn the engine off and remove the dynamic timing components.
7. If timing is off more than 2 degrees and there are indications of incorrect timing, such as poor performance or smoke, check the static timing using the lock pins. If the engine is performing normally and there is no evidence of excessive smoke or poor performance, check all meter connections and, if necessary, have meter calibration verified.

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Static Timing

Pump On Engine (Check Timing)

1. Rotate engine clockwise. Set engine at correct static timing angle with No. 1 piston on the compression stroke. Fit Timing Lock Pin T87T-6379-A through the timing bracket into the correct crankshaft damper groove (Figure 15).

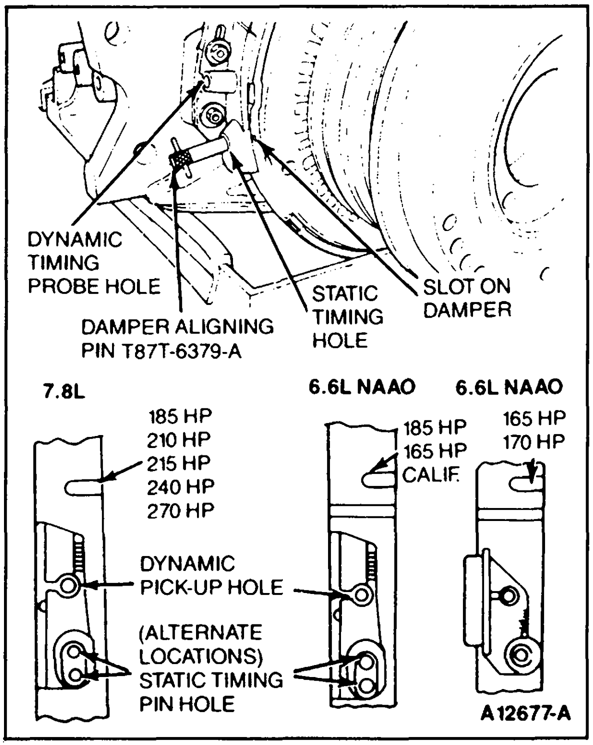

Figure 15 Fitting Timing Pin Into Crankshaft Damper

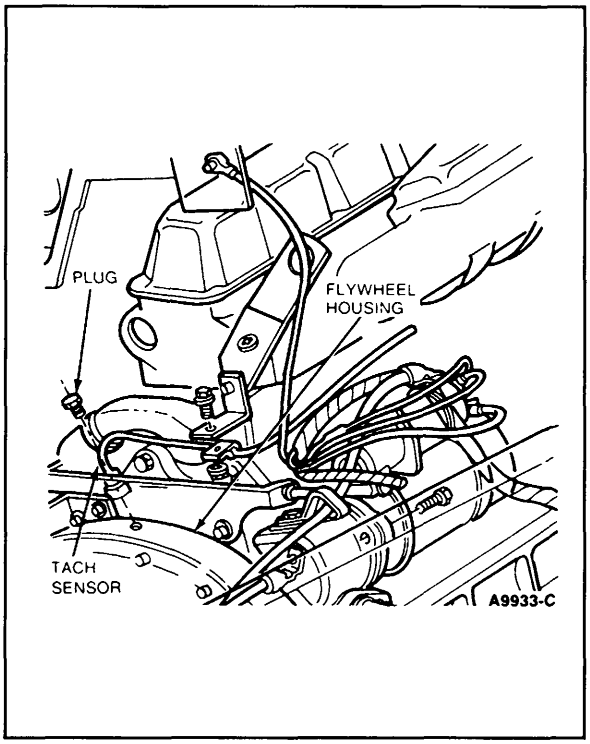

Figure 16 Tach Sensor or Plug Location

NOTE: The proper timing angle on the compression stroke of No. 1 cylinder is indicated by removing No. 1 injector and feeling for compression while turning the engine in the direction of rotation. When compression is felt, continue turning the engine until the alignment pin drops into the appropriate groove in the crankshaft damper cover. This indicates that the engine crankshaft is at the correct static timing angle with No. 1 piston on the compression stroke. Always approach the lock pin groove while turning the engine clockwise to ensure that gear backlash will not affect timing.

NOTE: When unable to access front damper mounting bolt to rotate engine, remove plug or tach sensor at top of flywheel housing to rotate flywheel ring gear with large screwdriver.

CAUTION

Do not, under any circumstances, loosen or remove the timing bracket.

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Static Timing

2. Remove the plug from the injector pump adapter plate timing pin location and install timing lock pin into the adapter plate (Figure 17).
3. It is important that the lock pin seats fully in the slot in the injection pump hub (to within 3mm (1/8-inch) of the shoulder of the lock pin) to shoulder of eccentric pin lock screw. This verifies proper engine timing. If the lock pin is not fully seated the timing will be incorrect.

CAUTION

Do not turn crankshaft with timing lock pins in place.

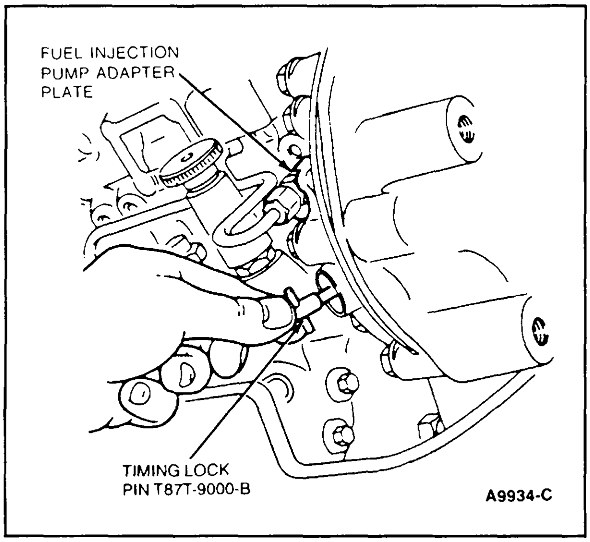

Figure 17 Lock Pin in Adapter Plate Installation

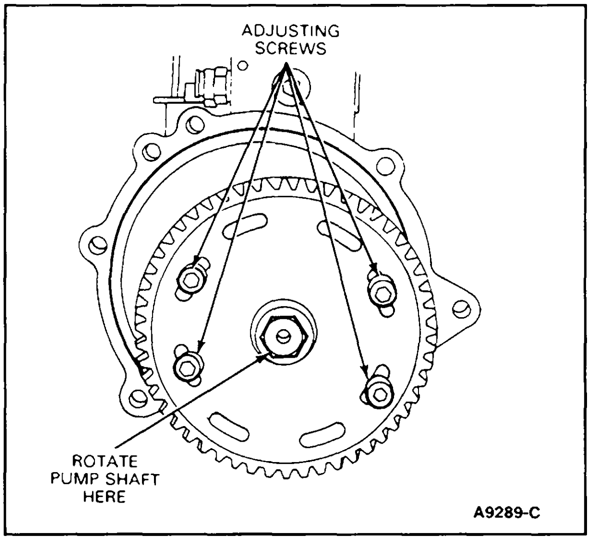

Figure 18 Injection Pump Gear Hub Adjusting Screws

NOTE: To properly adjust timing, be sure the damper timing pin is installed in the proper location with the No. 1 piston on the compression stroke.

4. To adjust timing, loosen the four adjusting screws on the injection pump gear hub (Figure 18). Rotate the pump shaft until the pump timing lock pin can be pushed into position and fully seated.
5. Turn gear counterclockwise by hand to remove backlash (it will move slightly). Tighten the four adjusting screws to 7 N•m (5 lb-ft). Remove the lock pins and tighten the adjusting screws to 22-34 N•m (16-25 lb-ft). Replace plug and sealing washer in adapter plate timing pin hole. Tighten to 9-12 N•m (7-9 lb-ft).
6. Rotate engine counterclockwise 90 degrees and then clockwise to the point where timing lock pin can be inserted in crankshaft damper. Insert timing lock pins into crankshaft damper and into fuel injection pump hub. If pin seats in injection pump gear hub, timing is correct. If it does not seat, repeat timing procedure.

Injection Pump Removed From Engine — Timing Bracket Removed or Loosened

1. Align timing bracket chisel mark with chisel mark on engine front cover. Tighten the timing bracket screw to 9-12 N•m (7-9 lb-ft).

NOTE: If a new timing bracket is being installed, it is necessary to accurately position the timing bracket with the damper timing groove. This requires a special procedure found in Shop Manual, Section 22-12.

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Static Timing

2. Lock the fuel injection pump at port closure by inserting the lock pin into the fuel injection pump adapter housing so that it locks into the slot in the injection pump hub.
3. Set the engine, with No. 1 cylinder on the compression stroke, at static timing angle using the timing bracket and lock pin. Rotate the engine at least 20 degrees counterclockwise, then clockwise until the lock pin in the timing bracket engages the correct groove in the damper cover.
4. Loosen the four adjusting screws on injection pump gear hub.
5. Install the injection pump on the engine and align the adapter bolt holes to holes on engine. Install pump bolts and tighten to 27-34 N•m (20-25 lb-ft).
6. Rotate the pump gear counterclockwise to remove the pump gear backlash. Tighten the four adjusting screws on the hub to 7 N•m (5 lb-ft). Remove the timing lock pin from the pump. Tighten the four adjusting screws to 22-34 N•m (16-25 lb-ft). Install the lock pin hole plug to 9-12 N•m (7-9 lb-ft).
7. Install engine components and check dynamic timing as outlined.

Injection Pump Off Engine — Timing Bracket Undisturbed

- Perform Steps 2 through 7 of Static Timing: Injection Pump Off Engine — Timing Bracket Removed or Loosened.

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Fuel System Description

Figure 20 shows the two sides of the fuel system. In the low-pressure side, fuel pressure does not normally rise above 206 kPa (30 psi). In the high-pressure side, fuel pressure can be over 68,950 kPa (10,000 psi).

In the low-pressure side, fuel is supplied to the injection pump by the lift pump. Fuel flows from the fuel tank to the fuel box, to the lift pump, through the dual filters to the injection pump.

In the high-pressure side, the injection pump plungers raise the pressure to over 68,950 kPa (10,000 psi) and distributes fuel to the injector nozzles by way of the high-pressure fuel lines.

Approximately 40% of the fuel reaching the fuel injection pump and injectors is used for combustion. The remaining fuel cools and lubricates the fuel injection pump and injectors and returns to the fuel tank through a fuel return line.

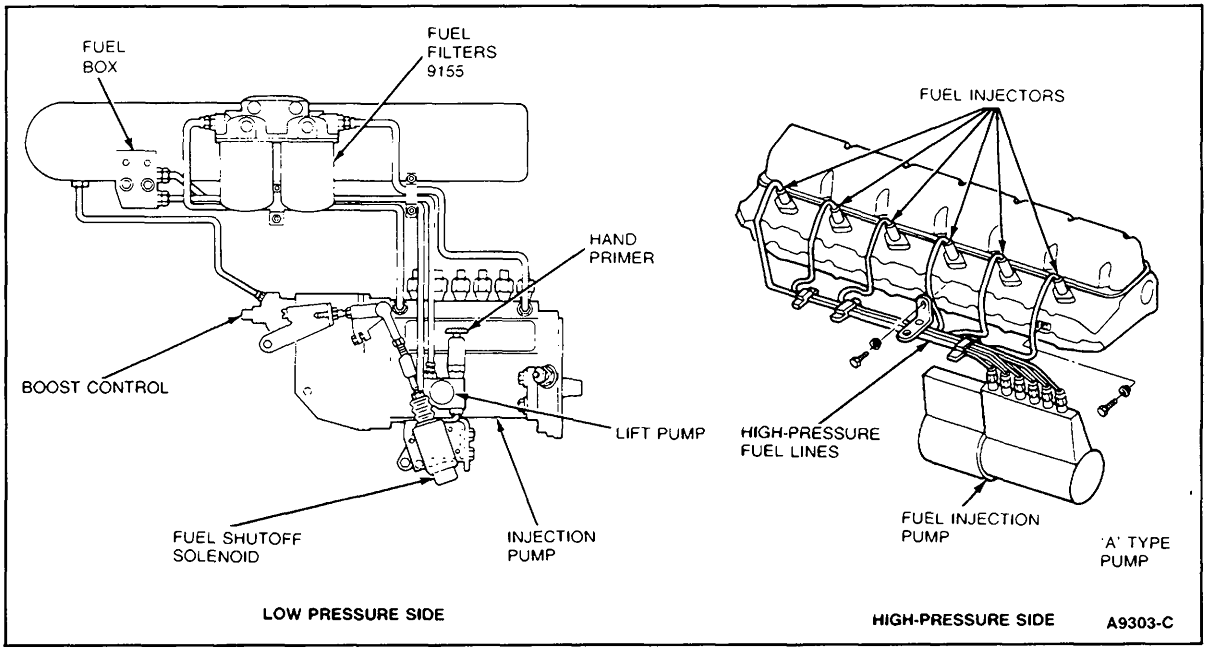

Figure 19 Typical 6.6L, 7.8L Ford Diesel Engine Fuel System

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Symptom Analysis

Consult the Symptom Analysis Pinpoint Diagnosis procedures first. These will direct you to a service to be performed or they will direct you to the Engine Performance Diagnosis procedure.

If the problem is low power and/or increased fuel consumption, go directly to the Engine Performance Diagnosis procedure.

Evaluating "Normal" Diesel Engine Exhaust Smoke

The following is a description of what is "normal" and expected exhaust smoke for a vehicle with a diesel engine. Diesel exhaust smoke can vary in color and consistency. The following chart should help in determining what causes certain types and colors of exhaust smoke and what should be done. Normal diesel exhaust smoke can be classified into two categories according to the color of the smoke.

The first category is blue-white smoke. Blue-white smoke may be observed at all ambient temperatures but should not occur after the vehicle is warmed and being driven. Blue-white smoke may occur after engine warm-up during extended idling due to the combustion chambers cooling down.

NOTE: Chassis fuel system air leaks also may cause continuous heavy blue-white smoke. Service fuel system as required.

The second category of diesel exhaust smoke is black smoke. Black smoke is caused by an overrich mixture, and normally occurs whenever the engine is working hard. The engine works hard when it is going up a steep grade, carrying a heavy load, or during heavy acceleration. More black smoke will be observed when operating the vehicle at higher altitudes because the air is thinner. If black smoke is observed while the engine is idling (at low altitude) or under normal driving conditions, the problem should be diagnosed as soon as possible.

There is a third category of diesel exhaust smoke which is not normal; blue smoke. Blue smoke occurs when oil is entering the combustion chamber and is burning along with the fuel. Smoke of this color usually indicates a definite problem which should be corrected as soon as possible.

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Symptom Analysis

Hard Starting/No Start	Pinpoint Test A
Engine Surges	Pinpoint Test B
Engine Misses	Pinpoint Test C
Excessive Black Smoke	Pinpoint Test D
Fog-Like Exhaust (White or Blue) in Full-Load Range	Pinpoint Test E
Engine Cannot Reach Governed rpm	Pinpoint Test F
Engine Knocks	Pinpoint Test G
Turbocharger Noisy	Pinpoint Test H
Cyclic Sound From Turbocharger	Pinpoint Test J
Oil Leak From Turbocharger Compressor or Turbine Seal	Pinpoint Test K
Low Oil Pressure with Proper Oil Level	Pinpoint Test L
Excessive Oil Consumption	Pinpoint Test M
Fuel Dilution in Lubricating Oil	Pinpoint Test M
Excessive Coolant Temperature-Temperature Above 105°C (220°F)	Pinpoint Test P
Fuel Injection Pump Overheating	Pinpoint Test Q
Low Power	Go to Engine Performance Diagnosis Procedure.
Increased Fuel Consumption	Go to Engine Performance Diagnosis Procedure.

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Hard Starting/No Start — Pinpoint Test A

TEST STEP	RESULT ▶	ACTION TO TAKE
A0 CHECK STARTING PROCEDURE		
• Check and follow correct starting procedure as outlined in Owner's Manual.	OK ▶	RETURN vehicle to customer.
	~~OK~~ ▶	GO to A1.
A1 CHECK CRANKING SPEED		
• Check engine cranking rpm. • Cranking speed should be a minimum of 110 rpm.	OK ▶	GO to A2.
	~~OK~~ ▶	SERVICE cranking system. REFER to Shop Manual, Group 28.
A2 CHECK FUEL FLOW		
• Check for fuel in fuel tank. • Loosen one injection line nut slightly while cranking engine. Fuel should discharge. **WARNING** **BE EXTREMELY CAREFUL TO PREVENT BEING STRUCK BY DIESEL FUEL UNDER PRESSURE. DIESEL FUEL AT INJECTION PRESSURE CAN EASILY PIERCE THE SKIN, POSSIBLY CAUSING SEVERE SKIN POISONING. IF STRUCK BY DIESEL FUEL, SEEK MEDICAL HELP IMMEDIATELY.**	OK ▶	GO to A4.
	~~OK~~ ▶	GO to A3.

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Hard Starting/No Start

Pinpoint Test A

TEST STEP	RESULT ▶	ACTION TO TAKE
A3 CHECK FUEL SHUTOFF SOLENOID		
• Check fuel shutoff solenoid linkage for binding. • Check fuel solenoid shutoff electrical terminals for dirt or corrosion and loose or broken electrical connections. • With ignition in RUN position, measure voltage at fuel shutoff solenoid. Voltage should be a minimum of 9 volts.	OK ▶	GO to A4. GO to Fuel Shut-Off Electrical System Diagnosis, Section 33-48.
	~~OK~~ ▶	SERVICE or REPLACE linkage or fuel shutoff solenoid. REFER to Shop Manual, Section 25-06. REPEAT Step A2.
A4 CHECK STARTING AID		
• Check that starting aid is operating properly. Refer to Shop Manual, Section 25-06.	OK ▶	GO to Engine Performance Diagnosis procedure.
	~~OK~~ ▶	SERVICE starting aid. REFER to Shop Manual, Section 25-06. REPEAT Step A4. **NOTE: REVIEW proper cold-starting procedure with customer, if necessary.**

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Engine Surges

Pinpoint Test B

TEST STEP	RESULT ▶	ACTION TO TAKE
B0 CHECK FUEL TANK		
• Check to see if fuel tank is empty or if tank vent is blocked.	OK ▶	GO to Engine Performance Diagnosis procedure.
	~~OK~~ ▶	FILL fuel tank. BLEED air from fuel system. CHECK tank vent. REFER to Shop Manual, Sections 25-06 and 25-50.

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Engine Misses

Pinpoint Test C

TEST STEP	RESULT ▶	ACTION TO TAKE
C0 ISOLATE MISS		
• Loosen each injector nozzle line nut (one at a time) while engine is running. Refer to On-Vehicle Injector Nozzle Testing. **WARNING** **BE EXTREMELY CAREFUL TO PREVENT BEING STRUCK BY DIESEL FUEL UNDER PRESSURE. DIESEL FUEL AT INJECTION PRESSURE CAN EASILY PIERCE THE SKIN, POSSIBLY CAUSING SEVERE SKIN POISONING. IF STRUCK BY DIESEL FUEL, SEEK MEDICAL HELP IMMEDIATELY.**	Miss not isolated to specific cylinder ▶	GO to Engine Performance Diagnosis procedure.
	Miss isolated to specific cylinder ▶	GO to C1 .
C1 CHECK NOZZLE FUEL DELIVERY		
• Check injector nozzle fuel line(s) for damage or restrictions. • Perform injector nozzle test as outlined under On Bench Injection Nozzle Testing.	OK ▶	GO to C2 .
	~~OK~~ ▶	CLEAN or REPLACE restricted or damaged line(s). REFER to Shop Manual, Section 25-06. REPLACE nozzle(s) as outlined under On Bench Injection Nozzle Testing.
C2 CYLINDER COMPRESSION CHECK		
• Perform cylinder compression test as outlined.	OK ▶	GO to Engine Performance Diagnosis procedure.
	~~OK~~ ▶	GO to C3 .
C3 CHECK CRANKCASE PRESSURE		
• Perform Engine Performance Diagnosis procedure Test Step **EPC.11B.**	OK ▶	SERVICE valve train as necessary. REFER to Shop Manual, Section 22-12.
	~~OK~~ ▶	OVERHAUL problem cylinder(s). REFER to Shop Manual, Section 22-12.

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Excessive Black Smoke | Pinpoint Test | D

TEST STEP	RESULT ▶	ACTION TO TAKE
D0 VERIFY SMOKE LEVEL		
• Verify under what conditions black smoke occurs. **NOTE: Excessive black smoke may be accompanied by poor performance or low power.** **NOTE: Refer to Symptom Analysis.**	Light load or low altitude ▶	GO to D1 . **NOTE: For warranty claim approval, Engine Performance Chart must be filled out.**
	Under heavy load ▶	A certain amount of black smoke is normal when going up steep grades, under maximum load, maximum boost, maximum acceleration or at high altitude.
D1 EXHAUST RESTRICTION CHECK		
• Inspect exhaust system for kinks or restriction. • Disconnect exhaust system at turbo and check performance.	OK ▶	GO to D2 .
	~~OK~~ ▶	SERVICE or REPLACE exhaust system components as necessary. REFER to Shop Manual, Section 26-01.
D2 CHECK AIR INTAKE RESTRICTION		
• Perform Engine Performance Diagnosis Test Step **EPC.7.**	OK ▶	GO to D3 .
	~~OK~~ ▶	REPLACE air filter or other components as required.

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Excessive Black Smoke

Pinpoint Test D

TEST STEP	RESULT ▶	ACTION TO TAKE
D3 CHECK STATIC TIMING		
• Check static engine timing as outlined in this manual.	OK ▶	GO to Engine Performance Diagnosis Test Step **EPC.10.**
	~~OK~~ ▶	Set static engine timing as outlined in this manual.
D4 CHECK NOZZLE FUEL DELIVERY		
• Check injector nozzle fuel line(s) for damage or restrictions.	OK ▶	GO to **EPC.11.**
• Perform On-Vehicle Injector Nozzle test as outlined. **WARNING** **BE EXTREMELY CAREFUL TO PREVENT BEING STRUCK BY DIESEL FUEL UNDER PRESSURE. DIESEL FUEL AT INJECTION PRESSURE CAN EASILY PIERCE THE SKIN, POSSIBLY CAUSING SEVERE SKIN POISONING. IF STRUCK BY DIESEL FUEL, SEEK MEDICAL HELP IMMEDIATELY.**	~~OK~~ ▶	REPLACE restricted or damaged line(s). REFER to Shop Manual, Section 25-06 or REPLACE nozzle(s) as outlined under On Bench Injection Nozzle Testing. If problem still exists, REPLACE the injection pump. REFER to Shop Manual, Section 25-06. **NOTE: For warranty claim approval, Engine Performance chart must be filled out.**

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Fog-Like Exhaust (White or Blue) In Full-Load Range

Pinpoint Test E

TEST STEP	RESULT ▶	ACTION TO TAKE
E0 CHECK COOLING SYSTEM		
• Check to see that engine is reaching operating temperature.	OK ▶	GO to E2.
	~~OK~~ ▶	GO to E1.
E1 THERMOSTAT OPERATION		
• Remove thermostats and test for proper operation. Refer to Shop Manual, Section 22-12.	OK ▶	GO to E3.
	~~OK~~ ▶	REPLACE thermostat(s). REFER to Shop Manual, Section 22-12. REPEAT Step E0.
E2 EXCESSIVE OIL LEVEL		
• Check engine oil level indicator for excessive oil fill.	OK ▶	GO to E3.
	~~OK~~ ▶	DRAIN excess oil from oil pan. If problem still exists, GO to E3.
E3 CHECK CRANKCASE BREATHER/ROAD DRAFT TUBE		
• Check for restricted crankcase breather element or plugged crankcase road draft tube.	OK ▶	GO to E4.
	~~OK~~ ▶	When obstruction is removed, RUN engine for 30 minutes to burn off accumulated oil in exhaust system.
E4 CHECK FUEL RETURN		
• Perform Engine Performance Diagnosis Test Step **EPC.8E.** NOTE: **If the fuel injection pump overflow valve is stuck shut, it will simulate a clogged fuel return line. To check this valve, measure inlet pressure to the injection pump. If the pressure exceeds 193 kPa (28 psi) at rated rpm the valve must be removed and cleaned or replaced. Refer to Shop Manual, Section 25-06.**	OK ▶	PERFORM Engine Performance Diagnosis procedure.
	~~OK~~ ▶	SERVICE or REPLACE fuel return line(s). REFER to Shop Manual, Section 25-06. REPEAT Step E3.

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Engine Cannot Reach Governed RPM

Pinpoint Test F

TEST STEP	RESULT ▶	ACTION TO TAKE
F0 VEHICLE OVERLOADED		
• Check to see if vehicle is being overloaded (above specified GVW).	Vehicle is overloaded ▶	INFORM customer to reduce loads.
	Vehicle load normal ▶	GO to F1.
F1 THROTTLE LINKAGE		
• Check throttle adjustment as outlined under Engine Performance Diagnosis Test Step **EPC.3.**	OK ▶	PERFORM Engine Performance Diagnosis procedure.
	~~OK~~ ▶	ADJUST the throttle adjustment. REFER to Shop Manual, Section 25-60.

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Engine Knocks

Pinpoint Test G

TEST STEP	RESULT ▶	ACTION TO TAKE
G0 VEHICLE OVERLOADED		
• Check to see if vehicle is being overloaded (above specified GVW).	Vehicle is overloaded ▶	INFORM customer to reduce load.
	Vehicle load normal ▶	GO to G1.
G1 BELT DRIVE ACCESSORIES		
• Check engine front drive components for proper operation.	OK ▶	GO to G2.
	~~OK~~ ▶	SERVICE or REPLACE components as necessary. REFER to specific accessory Shop Manual Section.
G2 ENGINE COOLANT TEMPERATURE		
• Verify engine coolant temperature is below 105°C (220°F).	OK ▶	GO to G3.
	~~OK~~ ▶	GO to Pinpoint Test **Q.**
G3 ISOLATE ENGINE KNOCK		
• Loosen each injector nozzle line nut (one at a time) while running engine. **WARNING** **BE EXTREMELY CAREFUL TO PREVENT BEING STRUCK BY DIESEL FUEL UNDER PRESSURE. DIESEL FUEL AT INJECTION PRESSURE CAN EASILY PIERCE THE SKIN, POSSIBLY CAUSING SEVERE SKIN POISONING. IF STRUCK BY DIESEL FUEL SPRAY, SEEK MEDICAL HELP IMMEDIATELY.**	Engine knock not isolated to specific cylinder ▶	GO to Engine Performance Diagnosis procedure.
	Engine knock isolated to specific cylinder(s) ▶	GO to G4.
G4 CHECK NOZZLE FUEL DELIVERY		
• Check injector nozzle fuel line(s) for damage or restrictions. • Perform injector nozzle test as outlined under On Bench Injector Nozzle Testing.	OK ▶	GO to Engine Performance Diagnosis procedure.
	~~OK~~ ▶	SERVICE or REPLACE restricted or damaged line(s). REFER to Shop Manual, Section 25-06 or REPLACE nozzle(s) as outlined under On Bench Injector Nozzle Testing.

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Turbocharger Noisy

Pinpoint Test H

TEST STEP	RESULT ▶	ACTION TO TAKE
H0 AIR INTAKE OBSTRUCTION		
• Check for obstruction or restriction in: a. Duct between air cleaner and compressor inlet b. Duct between the compressor outlet and intake manifold c. Intake manifold	OK ▶	GO to H1.
	~~OK~~ ▶	REMOVE obstruction or REPLACE damaged parts. REFER to Shop Manual, Section 22-12.
H1 AIR INTAKE LEAKS		
• Check for air leaks in: a. Duct between the air cleaner and compressor inlet b. Duct between the compressor outlet and intake manifold c. Intake manifold to engine connection d. Air cleaner housing and element	OK ▶	GO to H2.
	~~OK~~ ▶	REPLACE seals or tighten fasteners. REFER to Shop Manual, Section 22-12.
H2 EXHAUST SYSTEM RESTRICTION		
• Check for restricted or damaged exhaust system.	OK ▶	GO to H3.
	~~OK~~ ▶	SERVICE or REPLACE exhaust system components. REFER to Shop Manual, Section 26-01.
H3 EXHAUST GAS LEAK		
• Check for exhaust gas leak at: a. Exhaust manifold-to-engine connection b. Turbine inlet to exhaust manifold c. Turbine housing to center housing d. Turbine outlet to exhaust pipe	OK ▶	GO to H4.
	~~OK~~ ▶	REPLACE gaskets or TIGHTEN fasteners. REFER to Shop Manual, Section 25-45.

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Turbocharger Noisy

Pinpoint Test H

TEST STEP	RESULT ▶	ACTION TO TAKE
H4 COMPRESSOR WHEEL		
• Check for dirt caked on turbocharger compressor wheel or obvious signs of foreign object ingestion. **NOTE: If there is damage to compressor wheel or turbine wheel, the turbocharger will have to be replaced.**	OK ▶	GO to H5.
	~~OK~~ ▶	CLEAN the compressor wheel with a non-caustic cleaner and soft brush. FIND and CORRECT source of unfiltered air. CHANGE engine oil and oil filter.
H5 TURBOCHARGER		
• Remove turbocharger from engine. Check turbocharger for damage. Perform bearing clearance inspection. Refer to Shop Manual, Section 25-45.	OK ▶	INSTALL turbocharger on engine. GO to Step **EPC.12.**
	~~OK~~ ▶	REPLACE turbocharger. REFER to Shop Manual, Section 25-45.

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Turbocharger Noisy or Cyclic Sound From Turbocharger

Pinpoint Test J

TEST STEP	RESULT ▶	ACTION TO TAKE
J0 AIR INTAKE DUCT		
• Check for a restriction in air intake duct into turbo compressor inlet.	OK ▶	GO to J1 .
	~~OK~~ ▶	REMOVE obstruction or REPLACE damaged parts. REFER to Shop Manual, Section 25-40.
J1 COMPRESSOR WHEEL		
• Check for dirt caked on compressor wheel of turbocharger.	OK ▶	GO to Pinpoint Test Step H5 .
	~~OK~~ ▶	CLEAN compressor wheel with a non-caustic cleaner and a soft brush. LOCATE and CORRECT source of unfiltered air. CHANGE engine oil and oil filter.

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Oil Leak From Turbocharger Compressor Or Turbine Seal

Pinpoint Test K

TEST STEP	RESULT ▶	ACTION TO TAKE
K0 CHECK AIR INTAKE RESTRICTION		
• Perform Engine Performance Diagnosis Test Step **EPC.7.**	OK ▶	GO to K1.
	~~OK~~ ▶	REPLACE air filter or other components as needed. REFER to Shop Manual, Section 25-40.
K1 EXHAUST SYSTEM RESTRICTION		
• Inspect exhaust system for kinks or restriction. • Disconnect the exhaust system at the turbo and check performance.	OK ▶	GO to K2.
	~~OK~~ ▶	SERVICE or REPLACE exhaust system components as necessary. REFER to Shop Manual, Section 26-01.
K2 EXHAUST GAS LEAK		
• Check exhaust manifold-to-engine gaskets for leaks at ports.	OK ▶	GO to K3.
	~~OK~~ ▶	REPLACE exhaust manifold-to-engine gasket(s). REFER to Shop Manual, Section 22-12.
K3 CHECK TURBINE INLET		
• Check turbine inlet-to-exhaust manifold gasket for leaks.	OK ▶	GO to K4.
	~~OK~~ ▶	REPLACE exhaust manifold-to-turbocharger gasket. REFER to Shop Manual, Section 22-12.
K4 OIL DRAIN LINE OBSTRUCTION		
• Check oil drain line for restriction.	OK ▶	GO to K5.
	~~OK~~ ▶	SERVICE or REPLACE oil drain line. REFER to Shop Manual, Section 25-45.

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Oil Leak From Turbocharger Compressor Or Turbine Seal

Pinpoint Test K

TEST STEP	RESULT ▶	ACTION TO TAKE
K5 CRANKCASE VENT OBSTRUCTION		
• Check crankcase vent tube for damage or restriction.	OK ▶	GO to **K6**.
	~~OK~~ ▶	SERVICE or REPLACE crankcase vent tube. REFER to Shop Manual, Section 22-12.
K6 TURBOCHARGER CENTER HOUSING		
• Check turbocharger center housing for sludge or coke deposits.	OK ▶	GO to **K7**.
	~~OK~~ ▶	CHANGE engine oil and oil filter. REPLACE turbocharger, if necessary. REFER to Shop Manual, Section 25-45.
K7 EXCESSIVE BLOW-BY		
• Perform Engine Performance Diagnosis procedure Test Step **EPC.11B.**	OK ▶	GO to **K8**.
	~~OK~~ ▶	SERVICE engine as required. REFER to Shop Manual, Section 22-12.
K8 INTERNAL ENGINE PROBLEM		
• Perform compression test as outlined.	OK ▶	GO to **K9**.
	~~OK~~ ▶	SERVICE engine as required. REFER to Shop Manual, Section 22-12.

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Oil Leak From Turbocharger Compressor Or Turbine Seal

Pinpoint Test K

TEST STEP	RESULT ▶	ACTION TO TAKE
K9 COMPRESSOR WHEEL		
• Check for dirt caked on turbocharger compressor or turbine wheel for obvious signs of foreign object ingestion. **NOTE: If there is damage to compressor wheel or turbine wheel, the turbocharger will have to be replaced.**	OK ▶	GO to K10 .
	~~OK~~ ▶	CLEAN compressor wheel with a non-caustic cleaner and soft brush. FIND and CORRECT source of unfiltered air. CHANGE engine oil and oil filter.
K10 TURBOCHARGER		
• Check turbocharger for damage. Perform failure analysis. Refer to Shop Manual, Section 25-45.	OK ▶	CHECK for oil leakage from other sources.
	~~OK~~ ▶	REPLACE turbocharger. REFER to Shop Manual, Section 25-45.

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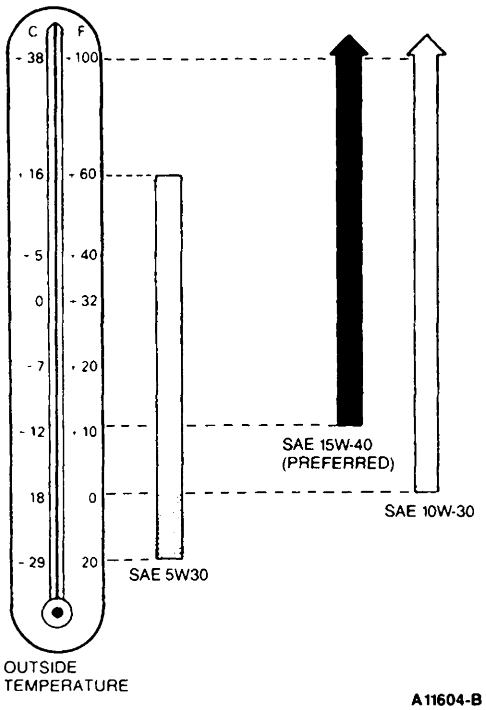
Low Oil Pressure With Proper Oil Level

Pinpoint Test L

TEST STEP	RESULT ▶	ACTION TO TAKE
L0 CHECK OIL PRESSURE		
• Remove oil pressure sending unit. Connect Rotunda Pressure Test Kit 014-00762 or equivalent 11706 to engine. Refer to Pressure Test Kit Hook-up, Figure 18. • Run engine until normal operating temperature is reached and check oil pressure. • Engine oil pressure should be 103 kPa (15 psi) minimum at Low Idle — 65-95 psi (488-655 kPa) at High Idle.	OK ▶ ~~OK~~ ▶	CHECK oil pressure gauge and/or sending unit. REFER to Shop Manual, Section 33-32. INSTALL sending unit. GO to L1.
L1 CHANGE ENGINE OIL AND FILTER		
• Change engine oil and filter. Use engine oil that meets API specification: SG/CE (recommended), SF/CE or CE. Determine viscosity according to ambient temperature.  • Run engine until normal operating temperature is reached. • Check oil pressure reading.	OK ▶ ~~OK~~ ▶	RETURN vehicle to customer. GO to L2.

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Low Oil Pressure With Proper Oil Level

Pinpoint Test **L**

TEST STEP	RESULT ▶	ACTION TO TAKE
L2 CHECK OIL PUMP DRIVE GEARS		
• Remove oil pan. • Check oil pump drive gears for damage or wear. • Check drive gear backlash. Refer to Shop Manual, Section 22-12.	OK ▶	GO to L3.
	~~OK~~ ▶	REPLACE oil pump drive gears. REFER to Shop Manual, Section 22-12.
L3 CHECK OIL PUMP INLET TUBE		
• Check oil pump inlet tubes for cracks. • Check that oil pump inlet tube attaching bolts are tightened to specification. Refer to Shop Manual, Section 22-12.	OK ▶	GO to L4.
	~~OK~~ ▶	REPLACE oil pump inlet tube or TIGHTEN attaching bolts to specification. REFER to Shop Manual, Section 22-12. CHECK engine oil pressure.
L4 CHECK OIL PRESSURE TUBE		
• Check oil pressure tube for cracks. • Check that oil pressure tube attaching bolts are tightened to specification. Refer to Shop Manual, Section 22-12.	OK ▶	SERVICE or REPLACE oil pump assembly as necessary. REFER to Shop Manual, Section 22-12.
	~~OK~~ ▶	REPLACE oil pressure tube or REPLACE oil pressure tube-to-engine block gasket and TIGHTEN attaching bolts to specification. REFER to Shop Manual, Section 22-12.

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Excessive Oil Consumption

Pinpoint Test M

TEST STEP	RESULT ▶	ACTION TO TAKE
M0 LEAK CHECK		
• Visually inspect for external oil leaks.	OK ▶	GO to M1.
	~~OK~~ ▶	SERVICE oil leaks. RETURN vehicle to customer.
M1 CHECK AIR INLET SYSTEM		
• Check for air cleaner restriction and check air induction system for leaks. Perform Engine Performance Diagnosis Test Step **EPC.11B.**	OK ▶	GO to M2.
	~~OK~~ ▶	SERVICE or REPLACE air inlet system components. REFER to Shop Manual, Section 22-12.
M2 VERIFY PROBLEM		
• Change the oil. Use oil that meets API specification: SG/CE (recommended), SF/CE or CE. Determine viscosity according to ambient temperature as shown on chart in Pinpoint Test Step **L1.** • Determine oil consumption rate and trend at: 1610 km (1000 miles/50 hours) or 8047 km (5000 miles/250 hours). • Record amount of make-up oil added during test period.	Oil consumption less than 0.95L (1 quart) per 483 km (300 miles) ▶	RETURN vehicle to customer. Oil consumption is normal.
	Oil consumption more than 9.5L (1 quart) per 483 km (300 miles) ▶	GO to M3.
M3 CHECK VEHICLE LOAD		
• Determine if abnormally heavy loads are being pulled by vehicle (above specified GVW).	Vehicle load normal ▶	GO to M4.
	Vehicles overloaded ▶	INFORM customer to reduce loads.
M4 CHECK VEHICLE OPERATION		
• Check for improper operation (i.e., allowing engine to lug in incorrect gear range) resulting in oil consumption.	Truck being driven correctly ▶	GO to M5.
	Engine being lugged ▶	INFORM customer to REVIEW operator habits to be sure engine is not being lugged.

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Excessive Oil Consumption

Pinpoint Test M

TEST STEP	RESULT ▶	ACTION TO TAKE
M5 CHECK AIR CLEANER RESTRICTION		
• Perform Engine Performance Diagnosis Test Step **EPC.7.** Restriction should be less than 2.5 kPa (10 in) H_2O.	Air cleaner restriction within specification ▶	GO to M6.
	Pulls over oil through turbocharger compressor seal ▶	REPLACE element. REPEAT M5.
M6 CHECK CRANKCASE BREATHER/ROAD DRAFT TUBE		
• Check for restricted crankcase breather element or plugged crankcase road draft tube. • Check crankcase pressure step **EPC.11B.**	OK ▶	GO to M7.
	~~OK~~ ▶	SERVICE or REPLACE breather element or vent. RUN engine for 30 minutes to burn off accumulated oil in exhaust system.
M7 CHECK AIR COMPRESSOR		
• Check air compressor for worn rings causing oil to leak into air system. Refer to Shop Manual, Section 12-40.	OK ▶	GO to M8.
	~~OK~~ ▶	SERVICE or REPLACE air compressor. REFER to Shop Manual, Section 12-40.
M8 CHECK VALVE GUIDES/SEALS		
• Check for worn engine valve guide seals or valve guides. Refer to Shop Manual, Section 22-12.	OK ▶	GO to M9.
	~~OK~~ ▶	CLEAN, INSPECT and REPLACE as necessary. REFER to Shop Manual, Section 22-12.
M9 CHECK COMPRESSION		
• Perform engine compression test as outlined.	OK ▶	RETURN vehicle to customer.
	~~OK~~ ▶	SERVICE engine as necessary. REFER to Shop Manual, Section 22-12.

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Fuel Dilution in Lubricating Oil

Pinpoint Test N

TEST STEP	RESULT ▶	ACTION TO TAKE
N0 VERIFY THE PROBLEM		
• Determine if there is fuel present in lubricating oil. **NOTE: If fuel is present, oil will have the odor of diesel fuel.**	No dilution ▶	RETURN vehicle to customer.
	Fuel diluted ▶	CHECK to see if vehicle has been idled for excessive periods. CHECK for internal fuel injection pump or injection nozzle leakage. REFER to Shop Manual, Section 25-06.

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Excessive Coolant Temperature Temperature Above 105°C (220°F)

Pinpoint Test P

TEST STEP	RESULT ▶	ACTION TO TAKE
P0 VERIFY CONDITION		
• Determine conditions when overheating occurs. **NOTE: Ambient temperatures above 43°C (110°F) may cause engine temperatures to exceed 105°C (220°F).**	Ambient temperature above 43°C (110°F) ▶	INFORM customer that condition is normal.
	Ambient temperature below 43°C (100°F) ▶	GO to P1 .
P1 VERIFY OPERATION		
• Check operator's driving habits (running in improper gear ranges, etc).	OK ▶	GO to P2 .
	~~OK~~ ▶	INFORM customer to REVIEW operator driving habits.
P2 CHECK ACCESSORIES		
• Check that all accessory equipment is approved. • Check accessory drive belt tension. Refer to Shop Manual, Section 27-06.	OK ▶	GO to P3 .
	~~OK~~ ▶	ADJUST belt tension or REPLACE belts. INFORM customer accessories are not approved.
P3 CHECK ENGINE		
• Check that engine is clean. • Check for engine coolant and/or oil leaks.	OK ▶	GO to P4 .
	~~OK~~ ▶	CLEAN engine. SERVICE engine coolant and/or oil leaks as necessary.
P4 CHECK ENGINE COOLANT		
• Check coolant condition. Refer to Shop Manual, Section 27-02.	OK ▶	GO to P5 .
	~~OK~~ ▶	DRAIN, FILL and BLEED the coolant system using the specified coolant and coolant conditioner. REFER to Shop Manual, Section 27-02.

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Excessive Coolant Temperature Temperature Above 105°C (220°F)

Pinpoint Test P

TEST STEP	RESULT ▶	ACTION TO TAKE
P5 CHECK RADIATOR, HOSES, CLAMPS		
• Check radiator cap for proper operation. • Check that correct hoses are installed and are properly clamped. • Check that radiator is correct for vehicle and is clean and unobstructed by bent fins, pinched tubes or foreign objects. • Check that correct fan is properly installed.	OK ▶ ~~OK~~ ▶	GO to P6. SERVICE or REPLACE components as necessary. REFER to Shop Manual, Group 27.
P6 CHECK WATER PUMP		
• Check water pump for worn bearings or coolant leaks.	OK ▶ ~~OK~~ ▶	GO to P7. SERVICE or REPLACE water pump. REFER to Shop Manual, Section 22-12.
P7 CHECK THERMOSTATS		
• Check thermostats for proper operation. Refer to Shop Manual, Section 22-12.	OK ▶ ~~OK~~ ▶	GO to P8. REPLACE thermostats. REFER to Shop Manual, Section 22-12.
P8 CHECK STATIC TIMING		
• Check injection pump static timing as outlined.	OK ▶ ~~OK~~ ▶	GO to P9. ADJUST static timing as outlined.

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Excessive Coolant Temperature Temperature Above 105°C (220°F) | Pinpoint Test | P

TEST STEP		RESULT ▶	ACTION TO TAKE
P9	CHECK FOR BLOWN HEAD GASKET		
	• Fill a bucket and suitable bottle with water. • Run engine until normal operating temperature is reached. Stop engine. • Place filled bottle in bucket with neck facing down. • Insert coolant overflow hose into neck of bottle. • Start engine and look for air bubbles in bottle.	No bubbles present ▶ Bubbles present ▶	GO to P10 . REPLACE blown head gasket. REFER to Shop Manual, Section 22-12.
P10	CHECK COOLING SYSTEM FOR CONTAMINATION		
		No contamination present ▶ Contamination present ▶	RETURN vehicle to customer. CLEAN cooling system. REFER to Shop Manual, Section 22-12.

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Fuel Injection Pump Overheating | Pinpoint Test | Q

TEST STEP	RESULT ▶	ACTION TO TAKE
Q0 OVERFLOW VALVE		
• Verify that fuel flows freely from overflow valve.	OK ▶	PERFORM Engine Performance Diagnosis Test Step **EPC.8E.**
	~~OK~~ ▶	CLEAN orifice in overflow valve or REPLACE fitting. REFER to Shop Manual, Section 25-06.

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Engine Performance Diagnosis Procedure

The Engine Performance Diagnosis procedure begins with those items which are the high frequency, easy-to-diagnose problems, and progresses to the low frequency, hard-to-diagnose problems. Use of this procedure will promote rapid, as well as accurate diagnosis.

The Engine Performance Diagnosis procedure follows, step-by-step, the Engine Performance Chart. Each test step is labeled to coincide with the Engine Performance Chart steps.

NOTE: Under no circumstances should the fuel injection pump, fuel injectors or turbocharger be replaced until the Engine Performance Chart has been completely filled out. Warranty claims for the fuel injection pump, fuel injectors and turbocharger will not be accepted unless the Engine Performance Chart has been filled out as specified and all tamper-proof seals are intact.

Service each problem detected before going on the next step. If service corrects the original complaint, it will not be necessary to proceed to the next test step. However, if the complaint is not corrected, continue with the procedure until the complaint is corrected.

The following explanations refer to the basic test steps of the Engine Performance Diagnosis procedure and Chart. They give a brief description of the effect on performance these problems can create, giving an understanding of the importance of each test step.

1. **External Leakage:** Fuel leakage can be a reason for diesel fuel smell, poor fuel economy or poor performance. Oil leakage can be a reason for high oil consumption. An air intake system leak can shorten engine and turbocharger life, especially under dusty conditions. Coolant leakage can result in engine overheating. Exhaust gas or boost air leakage can cause poor engine performance and black smoke.

2. **Exhaust System Condition:** Kinks or dents in the exhaust system can cause high exhaust back pressure. This can result in loss of power and high smoke levels. If an aftermarket exhaust brake is installed ensure:

   - Maximum exhaust pressure does not exceed 241 kPa (35 psi) @ 10 percent ABOVE engine rated rpm.

   - Exhaust brake assembly is mounted a minimum of 1.7m (5.5 ft) downstream from turbocharger.

3. **Accelerator Linkage:** If the accelerator linkage is improperly adjusted, damaged or worn, low idle speed may be out of specification and the engine may not reach high idle and top speed, causing pulling power to be reduced.

4. **Fuel System Condition:** Kinks in the fuel lines or hoses can block or restrict fuel flow and loose connections can leak air into the fuel. This can result in loss of power, high smoke levels and failure to start.

5. **Fuel Quality:** Diesel engines need clean fuel, free of air, dirt, water and microbiological organisms. Any contamination may result in poor engine performance.

   NOTE: If the fuel is contaminated with water, microbiological organisms are able to grow in a diesel fuel tank, especially in warm, moist climates. Therefore, it is very important to keep water from getting into the fuel.

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Engine Performance Diagnosis Procedure

The diesel fuel recommended for use in the 6.6L and 7.8L Ford Diesel engines must be either grade 1-D or 2-D. Use No. 2-D fuel when ambient temperatures are above −7°C (20°F). Use No. 1-D when ambient temperatures are below −7°C (20°F). If No. 1-D is not available, use winterized 2-D. Use of regular No. 2-D during cold weather may cause starting and/or driveability problems due to reduced fuel flow caused by fuel waxing.

The use of high sulfur fuel should be avoided. When fuel sulfur content exceeds 0.5 percent by weight, oil change intervals should be shortened. Consult the maintenance schedule for the required intervals.

6. **Engine Idle Speed:** Low engine idle speed may cause stalling or rough running.
7. **Air Cleaner Restriction:** A dirty air filter or restriction in the air cleaner may result in low power, excessive smoke, poor fuel economy and oil leakage from the turbocharger.
8. **Fuel System Pressure and Capacity:** The fuel supply system must deliver the proper quantity of fuel with no pressure loss or air leaks in the chassis fuel system and then return unused fuel to the fuel tank. Restriction in the lines providing fuel to the fuel injection pump will result in low power, smoke problems and generally poor performance. Restrictions in the lines returning fuel to the fuel tank may cause problems of injection pump overheating, smoke problems and generally poor performance.
9. **Injection Timing:** Incorrect timing can be responsible for poor fuel economy, rough idling, hard starting and excessive smoke. Injection timing can be checked either statically or dynamically but can only be set statically.
10. The injector nozzles must be removed from the engine for testing. This is a functional test of injector nozzle performance which checks opening pressure, spray pattern and leakage.
11. **Compression and Crankcase Pressure:** These tests examine the condition of internal components of the engine. Low compression indicates leakage past the piston rings or valves. Crankcase pressure measures the amount of blow-by past the rings. Excessive blow-by past the rings creates high pressure in the crankcase. The crankcase pressure test will also indicate a clogged crankcase ventilation system. Compression testing, crankcase pressure readings and rate of oil consumption should be used to evaluate engine mechanical condition.
12. **Turbocharger:** These tests and checks examine the condition of the turbocharger to determine if it is affecting engine performance. Problems which can be caused by a turbocharger include low power, excessive exhaust smoke, excessive engine oil consumption, noise and oil leaks. Most turbocharger checks are performed with the engine off. Boost pressure, although not included in the Engine Performance Section, can be checked, but it requires a dynomometer since a full load condition must be simulated. Specifications for turbocharger boost are given in the Engine Performance Specifications Section and an adapter is available with the pressure test kit for checking boost pressure.

To perform the Engine Performance Diagnosis procedure, it is necessary to connect the Rotunda Pressure Test Kit 014-00762 or equivalent (Figure 20). Use the explanations outlined under Pressure Testing With the Gauge Bar to help in attaching the gauges and interpreting the readings.

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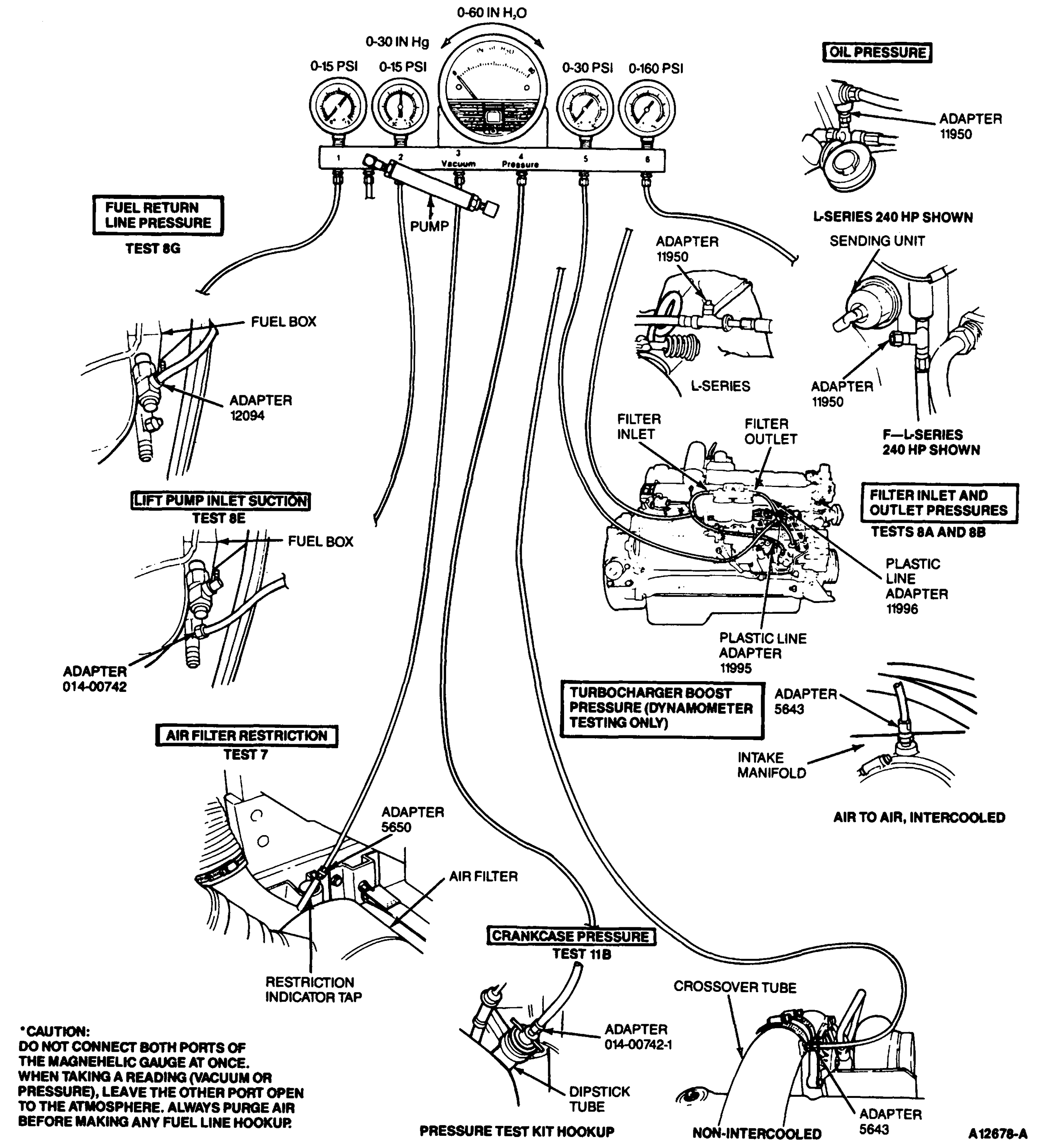
Engine Performance Diagnosis Procedure



*CAUTION:
DO NOT CONNECT BOTH PORTS OF THE MAGNEHELIC GAUGE AT ONCE. WHEN TAKING A READING (VACUUM OR PRESSURE), LEAVE THE OTHER PORT OPEN TO THE ATMOSPHERE. ALWAYS PURGE AIR BEFORE MAKING ANY FUEL LINE HOOKUP.

PRESSURE TEST KIT HOOKUP

A12678-A

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Engine Performance Diagnosis Procedure

Pressure Testing With the Gauge Bar

The gauge bar is used for several different pressure checks (Figure 20). Hookups are made using special adapters manufactured specifically for the 6.6L and 7.8L Ford Diesel engines.

NOTE: Use of the gauge bar is not mandatory. Individual gauges can be used, as long as they are accurate and applicable to a particular check. Technicians who own their own set of gauges may find that buying the Adapter Kit 014-00733 will make it easier to hook their gauges into the 6.6L and 7.8L Ford Diesel engines and systems.

6.6L and 7.8L Diesel Engines Performance Diagnosis Procedure

1986 6.6L (Phase I) 019-00034	Gage Bar Kit	1987 and Forward 6.6L and 7.8L 014-00762
NU-12094 ①	Lift Pump Inlet Adapter	014-00742-2 ③
NU-11950 ①	Fuel Return Adapter	NU-12094 ②
NU-5643 ①	Turbo Boost Adapter	NU-5643 ②
NU-5650 ①	Air Filter Adapter	NU-5650 ②
NU-11995 ①	Fuel Line	NU-11995 ②
NU-11996 ①	Fuel Line	NU-11996 ②
NU-11706 ①	Oil Pressure Adapter	NU-11950 ②
NU-11949	Crankcase Pressure Adapter	014-00742-1 ③

① Adapter Kit 019-00033

② Adapter Kit 014-00733

③ Adapter Kit 014-00742

NOTE: Adapter Kits 014-00733 and 014-00742 may be used with any previously released pressure Test Kit (Gage Bar).

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Engine Performance Diagnosis Procedure

Diagnostic tests that can be accomplished with the gauge bar along with hookup instructions are listed here:

Filter Inlet Pressure: Filter inlet pressure is measured by disconnecting the fuel line between the lift pump and the fuel filter inlet. In its place, a plastic line (11995) from the pressure test kit is installed. This line is equipped with a T-connection so that a pressure tap to the gauge bar can be made. Attach a line from the T-connection to the 0-1103 kPa (0-160 psi) gauge.

Filter Outlet Pressure: Filter outlet pressure is measured by disconnecting the fuel line between the fuel filter outlet and the inlet to the fuel injection pump. In its place, a plastic line (11996), from the pressure test kit is installed. This line is equipped with a T-connection so that a pressure tap to the gauge bar can be made. Attach a line from the T-connection to the 0-206 kPa (0-30 psi) gauge.

Connect both the Filter Inlet and Filter Outlet Pressure adapters at the same time to check the following:

- Filter Inlet Pressure
- Filter Outlet Pressure
- Pressure Drop Across the Fuel Filters
- Lift Pump Output Pressure
- Injection Pump Inlet Pressure (Fuel Galley Pressure)
- Air Leaks in the Fuel System (look for air bubbles in the plastic fuel lines)

Lift Pump Inlet Suction: To measure lift pump inlet suction, the coupling for the fuel line going into the fuel box from the fuel tank must be disconnected. At this point an adapter is screwed into the fuel box coupling and the fuel line coupling is screwed into the adapter. The adapter is equipped with a pressure tap which must be connected to 1-30 in Hg/0-15 psi gauge.

Fuel Return Line Pressure: To measure fuel return line pressure, the coupling for the fuel line going out of the box to the fuel tank must be disconnected. At this point, adapter 12094 is screwed into the fuel box. The adapter is equipped with a pressure tap which must be connected to the 0-1 bar (0-103 kPa or 0-15 psi) gauge.

Oil Pressure: Oil pressure is checked by tapping into a flexible line between the oil filter support and oil pressure sender switch. Use adapter 11950 to attach to either a coupling in the line or at the oil pressure sender switch at the dash panel.

Air Filter Restriction: Air filter restriction is checked at the same port where the restriction indicator is located. To check air filter restriction, remove the restriction indicator and install the adapter (5650) from the pressure test kit in its place. Connect the adapter to the vacuum side of the magnehelic gauge.

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Engine Performance Diagnosis Procedure

Crankcase Pressure: Crankcase pressure is measured from the dipstick tube. To make this check, remove the dipstick and install the adapter (014-00742-1) from the pressure side of the magnehelic gauge.

CAUTION

Do not connect both parts of the magnehelic gauge at once. When taking a reading (vacuum/pressure) leave the other port open to the atmosphere.

Turbo Boost Pressure: Turbo boost pressure is measured from a tap on the crossover tube or inlet manifold. Remove the tap and install the adapter (5643) from the pressure test kit. Connect the adapter to the 0-206 kPa (0-30 psi) gauge.

NOTE: Turbo boost pressure is checked only on a dynomometer or where full load conditions can be simulated.

Air Leak Testing

The gauge bar is equipped with a pressure pump. This pump can be used to pressurize fuel lines to help locate air leaks. Once an air leak is verified by seeing air bubbles in the fuel going to the injection pump, the exact location can be determined using the pressure pump and the following procedure:

1. Plug the end of the fuel line.
2. Install the pump into the system in front of the suspected air leak.
3. Pressurize the system to a maximum of 104 kPa (15 psi) and maintain pressure.
4. Wipe the fuel lines and connections with a soap and water solution.
5. An air leak will show up as bubbles.
6. Tighten the connection or replace components as needed to eliminate the leak.

Checking Fuel Cetane

Checking fuel is very important in diagnosis. Contaminants in the fuel, like water and microbiological organisms, are easy to see when a fuel sample is placed in a clear container. Diesel fuel should be clear, with an amber tint (actual color may vary). Water or particulates floating in the fuel are indicators of contaminated fuel. Diesel fuel must have a cetane rating of at least 40.

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Engine Performance Diagnosis

Pinpoint Test **EPC**

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC.1 CHECK FOR EXTERNAL LEAKAGE		
• With engine running, visually check for leakage of: 1. Fuel 2. Engine oil 3. Dirt past air cleaner 4. Coolant 5. Exhaust 6. Boost air	OK ▶	GO to **EPC.2.**
	~~OK~~ ▶	SERVICE or REPLACE faulty component(s). If performance problem still exists, GO to **EPC.2.**
EPC.2 CHECK EXHAUST SYSTEM		
• Visually check exhaust system for dents or kinks which could cause restriction.	OK ▶	GO to **EPC.3.**
	~~OK~~ ▶	SERVICE or REPLACE exhaust system components as required. REFER to Shop Manual, Section 26-01. GO to **EPC.3.**
EPC.3 ACCELERATOR LINKAGE ADJUSTMENT		
• With engine off, check that control lever contacts injection pump stops. Control lever must contact low idle stop when accelerator pedal is released, and must contact high idle stop when accelerator is fully depressed.	OK ▶	GO to **EPC.4.**
	~~OK~~ ▶	ADJUST or SERVICE vehicle throttle linkage as necessary. REFER to Shop Manual, Section 25-60. GO to **EPC.4.**
EPC.4 FUEL SYSTEM CONDITION		
• Inspect fuel supply and return lines and hoses for kinks, and all connections for tightness. **NOTE: If problem is "not starting", perform EPC.5A and EPC.5B.**	OK ▶	GO to **EPC.5A.**
	~~OK~~ ▶	SERVICE or REPLACE loose or damaged component(s). If performance problems still exist, GO to **EPC.5A.**

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Engine Performance Diagnosis

Pinpoint Test EPC

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC.5A CHECK FUEL FOR CONTAMINATION		
• Obtain a fuel sample and visually examine fuel in a clear container (including bottom of container), for particles, clouding, or liquid contamination, such as water.	OK ▶	GO to **EPC.6.**
	~~OK~~ ▶	REPLACE engine and chassis fuel filters. CLEAN and/or SERVICE fuel system. REFER to Shop Manual, Section 25-06. GO to **EPC.6.**
EPC.6 CHECK ENGINE IDLE SPEED		
• Check engine speed as outlined under Adjustments. • Bring engine up to normal operating temperature. • Idle speed is measured with manual transmission in NEUTRAL and automatic transmission in PARK. • Idle speed is shown on Vehicle Emission Control Information decal (VECI).	OK ▶	GO to **EPC.7.**
	~~OK~~ ▶	ADJUST idle speed as outlined in this Section. GO to **EPC.7.**
EPC.7 CHECK AIR INTAKE RESTRICTION		
• Remove air cleaner restriction indicator and install adapter 5650 and Rotunda Pressure Test Kit 014-00762 or equivalent. Refer to Figure 20. • Run engine at rated rpm, no load. • Record restriction reading. • Restriction should not exceed 2.5 kPa (10 in of H_2O).	OK ▶	REMOVE adapter. INSTALL cap on air cleaner port. GO to **EPC.8A.**
	~~OK~~ ▶	REPLACE filter element and CHECK intake system for blockage. REPEAT **EPC.7.** If restriction indicator is not functioning correctly, REPLACE it.

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Engine Performance Diagnosis	Pinpoint Test	EPC

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC.8A FUEL FILTER OUTLET PRESSURE		
• Install adapter 11996 with Rotunda Pressure Test Kit 014-00762 or equivalent. Refer to Figure 20. • Run engine at rated rpm with no load, transmission in PARK or NEUTRAL. • Record pressure reading. • Pressure should be 103-193 kPa (15-28 psi) at rated rpm.	OK ▶ Fuel pressure too low or fuel does not appear ▶ Fuel pressure too high ▶	GO to **EPC.8C.** GO to **EPC.8B.** GO to **EPC.8G.**
EPC.8B FUEL FILTER INLET PRESSURE		
• Install adapter 11995 with Rotunda Pressure Test Kit 014-00762 or equivalent. Refer to Figure 20. • Run engine at rated rpm with no load, transmission in PARK or NEUTRAL. • Record pressure reading. • Pressure should be 103-207 kPa (15-30 psi) with a maximum allowable pressure drop across the filter of 48 kPa (7 psi).	OK ▶ Pressure drop is greater than 48 kPa (7 psi) ▶ Pressure is below 103 kPa (15 psi) ▶	GO to **EPC.8C.** REPLACE fuel filters. REPEAT **EPC.8B.** GO to **EPC.8C.**
EPC.8C CHECK FUEL SYSTEM FOR AIR LEAKS		
• Run engine with adapters 11995 and 11996 installed, and observe clear plastic lines for air bubbles.	No bubbles present ▶ Bubbles present ▶	GO to **EPC.8E.** GO to **EPC.8D.**
EPC.8D CHECK CHASSIS FUEL LINES		
• Disconnect fuel supply line at engine and fuel tank. • Plug one end of line and connect pressure pump from Rotunda Pressure Test Kit 014-00762 or equivalent to other end of line. Refer to Figure 20. • Apply a maximum of 103 kPa (15 psi) to line, and hold pressure. • Apply a soap and water solution to all connections and fittings, and look for air bubbles.	Bubbles present ▶ No bubbles present ▶	SERVICE or REPLACE any leaking connection or fittings. REFER to Shop Manual, Section 25-50. REPEAT **EPC.8C.** SERVICE ends of fuel supply lines. CHECK fuel tank pickup for leaks. SERVICE or REPLACE fuel tank pickup. REFER to Shop Manual, Section 25-50. REPEAT **EPC.8C.**

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Engine Performance Diagnosis

Pinpoint Test EPC

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC.8E CHECK LIFT PUMP		
• Connect adapter 12094 and Rotunda Pressure Test Kit 014-00762 or equivalent to fuel box. Refer to Figure 20. • Run engine at rated rpm with no load, transmission in PARK or NEUTRAL. • Record vacuum reading. • Vacuum must be a maximum of 34 kPa (10 in Hg).	OK ▶	GO to **EPC.8F.**
	~~OK~~ ▶	SERVICE or REPLACE restricted fuel supply line. REFER to Shop Manual, Section 25-50. REPEAT **EPC.8E.**
EPC.8F CHECK LIFT PUMP VOLUME		
• Disconnect lift pump outlet and connect a clean sample hose. • Disconnect fuel shutoff solenoid. • Place end of sample hose in clean, graduated container and crank engine for 30 seconds. • Volume should be a minimum of 0.16L (1/3-pint) in 30 seconds.	OK ▶	GO to **EPC.8G.**
	~~OK~~ ▶	REPLACE lift pump. REFER to Shop Manual, Section 25-06. REPEAT **EPC.8F.**
EPC.8G CHECK FUEL RETURN PRESSURE		
• Disconnect fuel return line at fuel box. Install adapter 11950 and Rotunda Pressure Test Kit 014-00762 or equivalent. Refer to Figure 20. • Run engine at rated rpm with no load, transmission in PARK or NEUTRAL. • Record pressure reading. • Pressure should not exceed 41 kPa (6 psi) at rated rpm.	Fuel return pressure OK, EPC.8A OK ▶	GO to **EPC.9.**
	Fuel return pressure OK, but fuel filter outlet pressure in EPC.8A high ▶	SERVICE or REPLACE injection pump overflow valve. REFER to Shop Manual, Section 25-06. REPEAT **EPC.8A.**
	Fuel return pressure too high ▶	SERVICE or REPLACE fuel return line. REFER to Shop Manual, Section 25-50. REPEAT **EPC.8G.**
EPC.9 CHECK STATIC TIMING		
• Check injection pump static timing as outlined in this Section.	OK ▶	GO to **EPC.10.**
	~~OK~~ ▶	ADJUST static timing as outlined.

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Engine Performance Diagnosis | Pinpoint Test | EPC

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC.10 CHECK INJECTOR NOZZLES/LINES		
• Check injector nozzle lines for damage or restriction. • Remove injector nozzles. Refer to Shop Manual, Section 25-06. • Test injector nozzles as outlined.	OK ▶	GO to **EPC.11A.**
	~~OK~~ ▶	REPLACE damaged lines. REFER to Shop Manual, Section 25-06. CLEAN or REPLACE injector nozzles as outlined. REFER to Shop Manual, Section 25-06 for Installation. If performance problem still exists, GO to **EPC.11A.**
EPC.11A CHECK COMPRESSION		
• Check engine compression as outlined.	OK ▶	GO to **EPC.11B.**
	~~OK~~ ▶	SERVICE engine as necessary. REFER to Shop Manual, Section 22-12.
EPC.11B CHECK CRANKCASE PRESSURE		
• Remove engine oil dipstick and connect adapter 11949 and Rotunda Pressure Test Kit 014-00762 or equivalent. Refer to Figure 20. • Run engine at rated rpm with no load, transmission in PARK or NEUTRAL. • Record pressure reading. • Pressure should be a maximum of 0.7 kPa (3 in H_2O) at rated rpm.	OK ▶	GO to **EPC.12A.** GO to Pinpoint Test **E3** or **M6.**
	~~OK~~ ▶	Problem is internal to engine. REFER to Shop Manual, Section 22-12.

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Engine Performance Diagnosis

Pinpoint Test **EPC**

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC.12A CHECK TURBINE/COMPRESSOR WHEELS		
• Visually check turbocharger turbine and compressor wheels for evidence of contact with turbocharger housing (bent, broken, chipped or eroded blades) or foreign object ingestion damage or deposits.	OK ▶	GO to **EPC.12B.**
	~~OK~~ ▶	DETERMINE source of foreign object ingestion. SERVICE or REPLACE turbocharger and/or other components as necessary. REFER to Shop Manual, Section 25-45.
EPC.12B OIL LEAKAGE-EXHAUST PIPE ELBOW/TURBINE HOUSING		
• Check for oil deposits at connection between exhaust pipe elbow and turbine outlet. **NOTE: *Slight amount of oil seepage is normal after extended periods of idling.***	OK ▶	GO to **EPC.12C.**
	~~OK~~ ▶	REPLACE turbocharger. REFER to Shop Manual, Section 25-45.
EPC.12C OIL LEAKAGE-EXHAUST MANIFOLD/TURBINE HOUSING		
• Check for excessive oil deposits between exhaust manifold and turbine inlet. **NOTE: A slight amount of oil seepage is normal after extended periods of idling.**	OK ▶	GO to **EPC.12D.**
	~~OK~~ ▶	Problem is internal to engine. REFER to Shop Manual, Section 22-12.
EPC.12D OIL LEAKAGE-INTAKE MANIFOLD/ COMPRESSOR HOUSING		
• Check for oil deposits in intake manifold and compressor housing. **NOTE: Slight amount of seepage is normal after extended periods of idling.**	OK ▶	GO to **EPC.12E.**
	~~OK~~ ▶	CHECK for intake restriction. GO to **EPC.7.** If intake restriction is OK, GO to **EPC.12G.**

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Engine Performance Diagnosis

Pinpoint Test | **EPC**

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC.12E OIL LEAKAGE-OIL SUPPLY/DRAIN PIPE FLANGES		
• Check for oil leaks at oil supply and drain pipe flanges. • Check oil drain pipe for clogging.	OK ▶	GO to **EPC.12F.**
	~~OK~~ ▶	SERVICE or REPLACE oil drain pipe. TIGHTEN attaching bolts to specification. REPLACE gaskets as necessary. REFER to Shop Manual, Section 25-45.
EPC.12F CHECK FOR AIR LEAKS		
• Visually check for air intake and exhaust leaks at following: 1. Exhaust manifold to engine.[a] 2. Exhaust manifold to turbine inlet.[a b] 3. Turbine housing to center housing.[a b] 4. Turbine outlet to exhaust pipe elbow.[a b] 5. Compressor housing to center housing. 6. Compressor outlet to intake manifold.[c] 7. Compressor inlet to air cleaner duct. 8. Air cleaner housing and element.	OK ▶	GO to **EPC.12G.**
	~~OK~~ ▶	SERVICE or REPLACE leaking component(s). REFER to Shop Manual, Sections 22-12, 25-40 and/or 25-45.
EPC.12G CHECK BEARING PLAY		
• Check turbocharger axial and radial bearing play. Refer to Shop Manual, Section 25-45.	OK ▶	REPLACE fuel injection pump. REFER to Shop Manual, Section 25-06. ADJUST static timing as outlined.
	~~OK~~ ▶	REPLACE turbocharger. REFER to Shop Manual, Section 25-45.

[a] Possible whistle or scream noise varying with engine speed.

[b] May show signs of carbon buildup.

[c] May cause low boost.

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Injector Nozzle Testing

Where ideal conditions of good combustion, specified engine temperature control, and clean quality fuel prevail, nozzles require little attention. Nozzle trouble is usually indicated by one or more of the following symptoms:

- Exhaust smoke (black)
- Low power
- Missing under load
- Rough warm idle
- Excessive fuel consumption
- Engine will not rev up
- Combustion knock
- Overheating

On Vehicle Testing

When faulty nozzle operation is suspected on an engine that is misfiring or puffing black smoke, a simple test can be made to determine the problem nozzle(s).

1. Run the engine at the rpm which makes the problem most pronounced.
2. Momentarily loosen the high-pressure fuel inlet line connection on one nozzle assembly. Listen to see if it has an effect on the engine and look to see if the smoke level changes. Then tighten the connection to specification.

   WARNING

   BE EXTREMELY CAREFUL TO PREVENT BEING STRUCK BY DIESEL FUEL UNDER PRESSURE. DIESEL FUEL AT INJECTION PRESSURE CAN EASILY PIERCE THE SKIN, POSSIBLY CAUSING SEVERE INJURY FROM BLOOD POISONING. IF STRUCK BY PRESSURIZED DIESEL FUEL, SEEK MEDICAL HELP IMMEDIATELY.

3. Check each nozzle in the same manner.
4. If one nozzle is found where loosening makes no difference in performance or it causes the smoke level to change, that nozzle should be bench tested.

On Bench Testing

After removing the nozzle(s) from the engine, the injector nozzle pressure test should be performed. This test will provide valuable information regarding the condition of the nozzle(s). A clean workbench, clean washing fluid containers, clean tools and clean hands are essential to produce satisfactory results. Injector nozzles which are not functioning properly, have improper opening pressure, leak down, or spray patterns, should be replaced. Replacement injectors should be tested before assembly to engine.

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Injector Nozzle Testing

Figure 21 shows the Rotunda Injector Nozzle Tester 014-00300, used for pressure testing the injector nozzles. Use the following procedure for testing the injector nozzles.

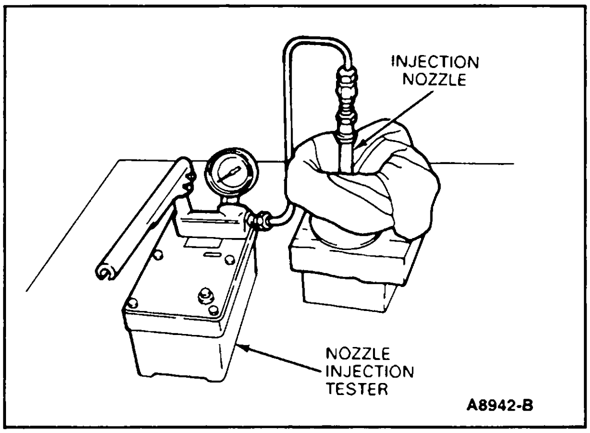

Figure 21 Injector Nozzle Tester

1. Prepare the stand for making tests. Place a container partly filled with shop cloths beneath the outlet pipe to catch the spray. Fill the stand reservoir with clean calibration fluid. Open the tester valve slightly and operate the tester handle to expel the air from the tester and outlet pipe. Operate the tester until solid fuel (no air bubbles) flows from the end of the outlet pipe. Close the tester valve.

   NOTE: Test injector nozzles using SAE approved calibration oil 208629, SAE J967D, or ISO 4113 fluid, rather than diesel fuel.

2. Install the proper adapter for testing the 6.6L and 7.8L Ford Diesel injectors on the injector nozzle test stand.

3. Connect the nozzle to the test stand. Take care to avoid cross-threading. Tighten connector nut securely with a wrench.

WARNING

ALWAYS WEAR APPROVED SAFETY GLASSES WHEN OPERATING THE TESTER. VOLATILE LIQUIDS CAN BE EXTREMELY FLAMMABLE WHEN VAPORIZED. AVOID ANY CONDITIONS (SPARKS, OPEN FLAMES, LIT CIGARETTES, ETC.) WHICH MIGHT IGNITE THE FLUID USED DURING THE TEST PROCEDURE. ENSURE THAT THE INJECTOR IS MOUNTED ON THE TESTER SO THAT THE SPRAY IS DIRECTED AWAY FROM THE OPERATOR AND ANY OTHER PERSONS. THE ONLY LIQUID APPROVED FOR USE IN THIS TESTER IS SAE CALIBRATION NO. 208629 OR EQUIVALENT CALIBRATION FLUID (SAE J967D OR ISO 4113).

WHEN A NOZZLE IS BEING TESTED OR IS IN OPERATION, KEEP HANDS AND OTHER PARTS OF THE BODY AWAY FROM THE SPRAYING NOZZLE. THE LIQUID SPRAY LEAVES THE NOZZLE TIP WITH SUFFICIENT FORCE TO PENETRATE THE SKIN AND CAUSE SERIOUS INJURY. THE NOZZLE TIP SHOULD BE ENCLOSED IN A TRANSPARENT RECEPTACLE IF AVAILABLE.

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Injector Nozzle Testing

4. Bleed air from the nozzle. Open the tester valve and operate tester handle for 8 to 10 quick strokes to expel (bleed) air from the injector nozzle. Test fluid should spray from the spray holes in the nozzle tip. If the nozzle is blocked or the needle jammed, replace the injector. Replacement injectors should be tested before assembly to the engine.

   NOTE: Conduct opening pressure, tip leakage and spray pattern tests separately. Do not attempt to evaluate more than one test step or result at a time.

5. **Check nozzle opening pressure** by pumping the injector nozzle tester and observing the pressure at which the needle valve lifts and fuel is ejected from the nozzle tip. Opening pressure must meet specifications or nozzle should be replaced.

6. **Check the nozzle for tip leakage.** Wipe the nozzle tip dry and operate the tester to maintain pressure at 2068 kPa (300 psi) below opening pressure of the nozzle. Hold the pressure for 10 seconds. If droplets form on the tip of the injector and fall off, the nozzle should be replaced. Wetness on the tip of the injector is acceptable.

   NOTE: Do not wipe the tip with fingers, because it tends to draw a small amount of fluid out of the injector giving a false impression of a leak. Use a clean cloth or blotting paper.

7. **Check the spray pattern of the nozzle** (Figure 22) by pumping the tester handle rapidly and observing the spray pattern coming from the orifices. Spray must come from each orifice and be similar in size and consistency. The spray should be well atomized and cone shaped as it comes from the injector nozzle. Injectors showing poor spray patterns should be replaced.

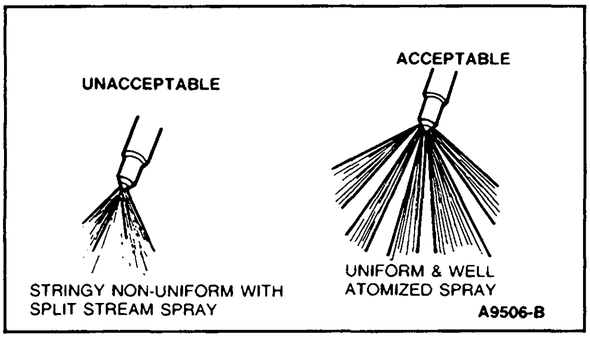

Figure 22 Spray Patterns

8. If the injector fails any of the tests, overhaul or replace the injector. Refer to Shop Manual, Section 25-06.

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Checking Compression

To check compression in the 6.6L and 7.8L Ford Diesel engines use the following procedure:

1. Be sure battery performance meets specifications.
2. Clean the engine, especially the area around the injectors.
3. Warm up the engine by operating for a minimum of 30 minutes at 1200 rpm.
4. Stop the engine and remove the high-pressure fuel lines and fuel leak-off line from the engine. Cap all the openings in the fuel injection system and fuel injection pump.
5. Remove the injector nozzle and seat washer from each cylinder. Cap the injector nozzle and line to prevent the entry of dirt into the system. Place the injectors in a rack to prevent damage while they are removed from the engine and to keep them in order.

   CAUTION

   If an injector is struck in the cylinder head and will not pull straight out, turn the injector in a clockwise direction to break it loose. If it is turned in a counterclockwise direction there is a chance that the nozzle and holder could unscrew from each other, allowing the internal components to fall out.

   NOTE: **The lines should not be capped until residual fuel has been removed from them. Otherwise, when the engine is cranked during the compression test, the fuel remaining in the lines will blow the caps off. To remove the residual fuel, crank the engine after the fuel shutoff solenoid has been disconnected, then cap the lines.**

6. Disconnect the electrical connector at the bottom of the fuel shutoff solenoid (Figure 23) and cover with tape. This must be done to shut off the flow of fuel to the engine during cranking.

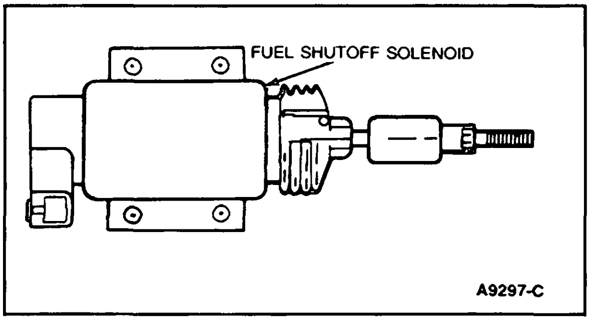

Figure 23 Fuel Shutoff Solenoid Terminals

7. Crank the engine to blow out any loose carbon particles from the injector bores.
8. Install the engine compression tester adapter 12210 into the injector bore of cylinder No. 1, using a new set washer and the injector mounting studs and nuts.
9. Connect Compression Gauge 014-00701 or equivalent and hose to the adapter.
10. Crank the engine (speed must be at least 200 rpm) and observe the gauge reading. Allow about 6-8 puffs per cylinder.
11. Repeat Steps 7 through 10 for each cylinder.
12. After completing the compression check, install the injector nozzles using new seat washers. Connect the injector lines back on the engine and attach the connector at the bottom of the fuel shutoff solenoid.

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Checking Compression

Test Conclusions

1. Minimum compression must be at least 1896 kPa (275 psi). Also, compression readings from the lowest cylinder must be at least 75 percent of the highest.
2. If any of the readings do not meet the above specifications, this indicates that there is leakage at the cylinder head gasket, piston rings or valves.

   NOTE: To determine if the rings or valves are at fault, squirt the equivalent of a tablespoon of heavy oil into the combustion chamber, then crank the engine to distribute the oil and repeat the compression test. The oil will temporarily seal leakage past the rings. During a compression test, if the pressure fails to climb steadily and remains the same during the first two succeeding strokes, or fails to climb during the entire test, suspect a sticking valve.
3. A low, even compression in two adjacent cylinders may indicate a cylinder head gasket leak. Check this before blaming the rings or valves.

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SECTION 20

Diesel Diagnostics — 7.3L Engine

Contents

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Preliminary Checkout

This Section covers adjustments, diagnostics, and test procedures for the 7.3L diesel engine Fast Start Glow Plug System and Fuel Injection System.

Checkout

- Visually inspect the engine compartment to ensure all wiring harnesses and fuel lines are properly routed, free of kinks and not contacting chassis or engine components and securely connected.
- Examine all wiring harnesses and connectors for insulation damage, burned, overheated, loose or broken conditions.
- Be certain the batteries are fully charged.
- All accessories should be off during testing and diagnosis.

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Test Equipment

The following test equipment (Figs. 1 through 5) is required for adjusting idle speed and timing.

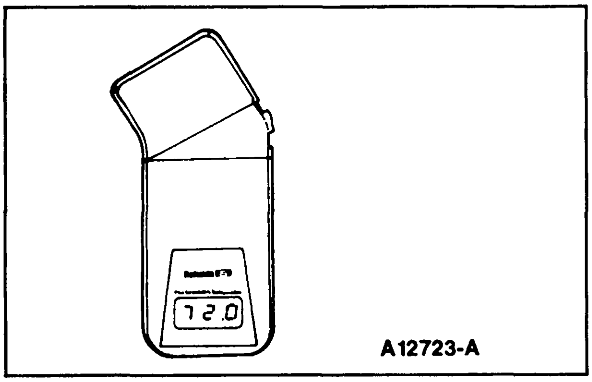

Figure 1 Rotunda 099-00001 Photoelectric Tachometer (For Engine RPM Checking Only)

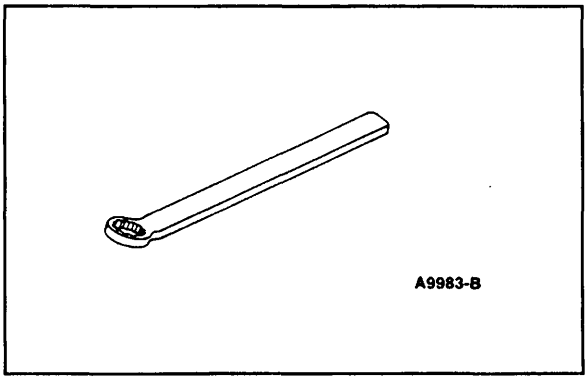

Figure 3 T86T-9000-C Injection Pump Mounting Wrench

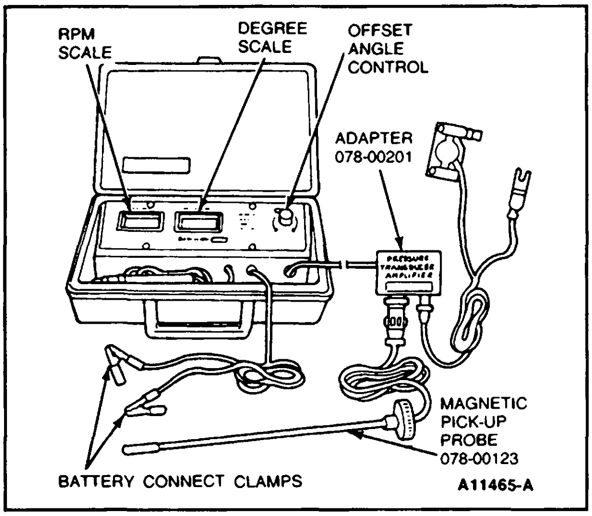

Figure 2 Rotunda 078-00200 Dynamic Timing Meter

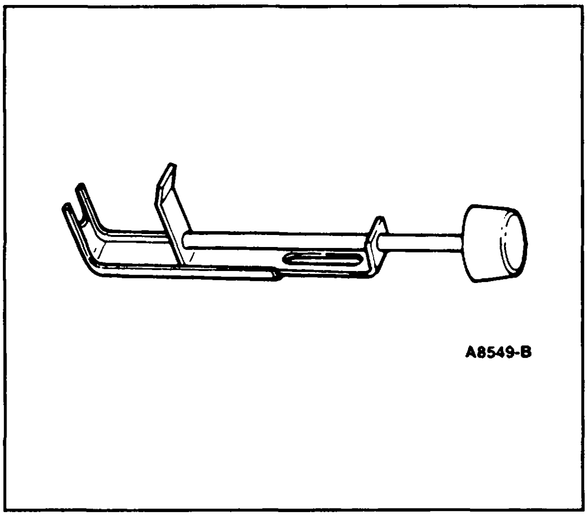

Figure 4 Throttle Control Tool D83T-9000-E

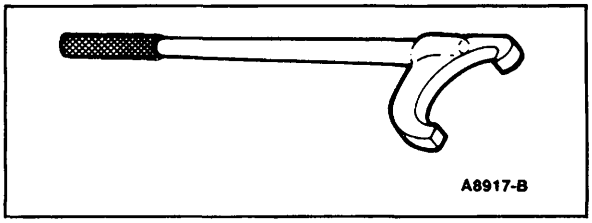

Figure 5 T83T-9000-C Injection Pump Rotating Tool

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Test Equipment

The following test equipment (Figs. 6 and 7) is required for performing the Engine Performance Diagnostic Procedure.

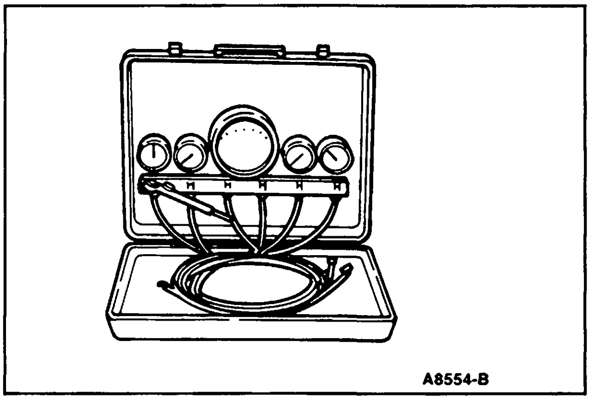

Figure 6 Rotunda 014-00702 Pressure Test Kit

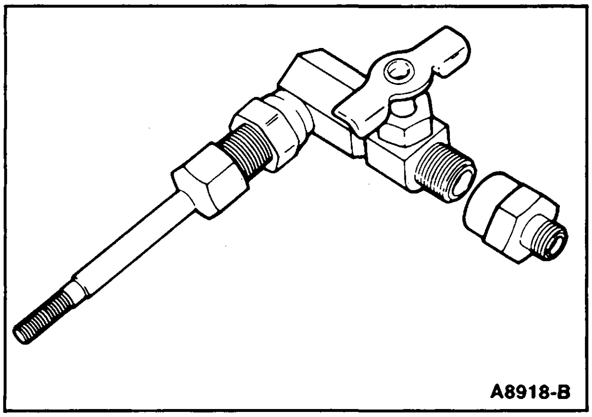

Figure 7 T83T-9000-A Fuel Transfer Pump Pressure Adapter

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Test Equipment

The following test equipment (Figs. 8 and 9) is required for performing the WAIT TO START Lamp Diagnostic Procedure and the Fast Start Glow Plug System Diagnostic Procedure.

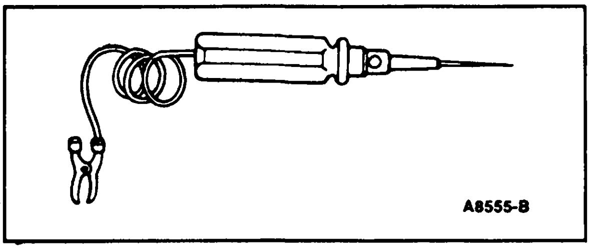

Figure 8 12-Volt Test Lamp

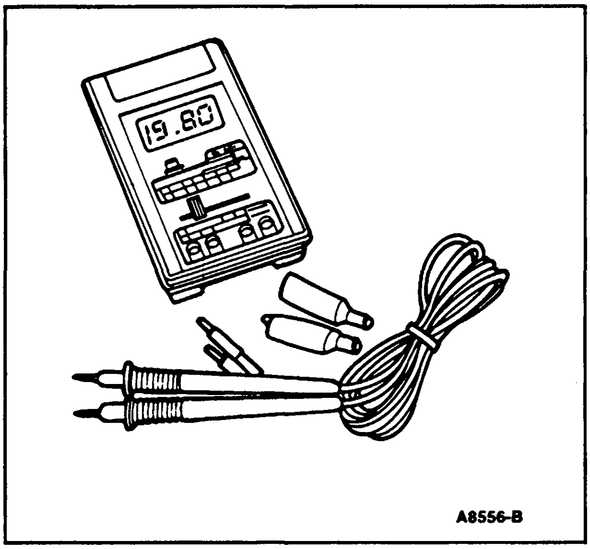

Figure 9 Rotunda 007-00001 Digital Volt Ohmmeter

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Test Equipment

The following test equipment (Figs. 10 and 11) is required for Injection Nozzle testing and cleaning.

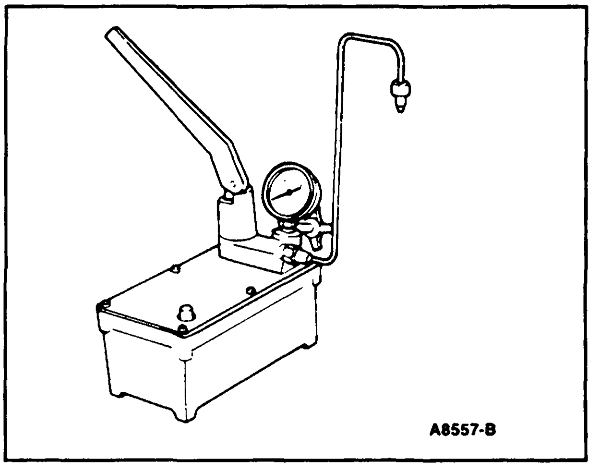

Figure 10 Rotunda 014-00300 Injector Nozzle Tester Special Service Tool D83T-9000-F

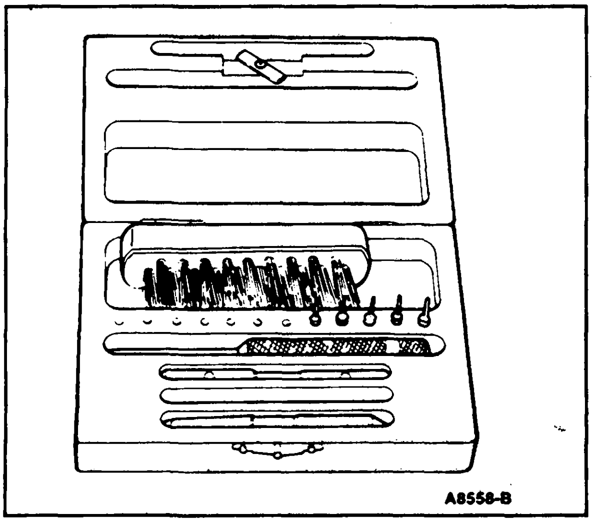

Figure 11 Rotunda 014-00301 Injector Nozzle Cleaning Kit Special Service Tool D83T-9000-G

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Idle Speed Setting Procedures

Curb Idle Speed Adjustment

1. Place transmission in NEUTRAL or PARK.
2. Bring engine up to normal operating temperature.
3. Idle speed is measured with manual transmission in NEUTRAL and automatic transmission in DRIVE.
4. Ensure that curb idle adjusting screw is against the stop. If not, correct vehicle linkage.
5. Check curb idle speed, using Rotunda 055-00108 or equivalent. Curb idle speed is specified on the Vehicle Emissions Control Information (VECI) decal. Adjust to specification using idle speed adjusting screw (Fig. 12).
6. Place transmission in NEUTRAL or PARK. Rev engine momentarily. Place transmission in specified gear and check curb idle rpm. Adjust again if necessary.

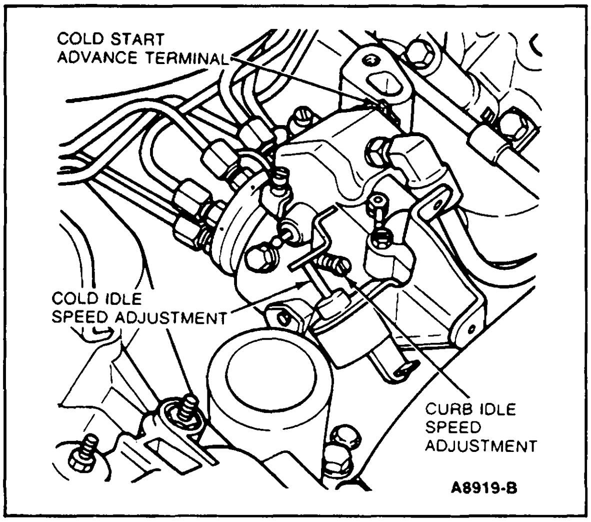

Figure 12 Idle Speed Adjusting Screw

Fast Idle Adjustment

At Cold Idle Solenoid:

1. Place transmission in NEUTRAL or PARK.
2. Start engine, and bring up to normal operating temperature.
3. Disconnect fast idle solenoid from wiring harness.
4. Apply battery voltage to solenoid to activate it.
5. Rev engine momentarily to set solenoid to activate it.
6. Check fast idle speed setting. Fast idle rpm should be 825 ± 25. Adjust to specification by turning solenoid plunger in or out (Fig. 12).
7. Rev engine momentarily and check fast idle rpm. Adjust as necessary.
8. Remove battery voltage from solenoid connector and connect to wiring harness.

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Setting Injection Timing — Static Timing

1. Remove fast idle bracket and solenoid from injection pump.
2. Break torque (keeping nuts snug) on three nuts attaching injection pump to pump mounting adapter using Tool T86T-9000-C or equivalent (Fig. 3).
3. Install rotating Tool T83T-9000-C (Fig. 5) on front of pump and rotate injection pump to align timing mark on injection pump mounting flange with timing mark on pump mounting adapter, to within ± 0.030 inch.
4. Remove rotating tool and tighten nuts to specification. Visually check timing to verify that timing marks are aligned (Fig. 13).
5. Install fast idle bracket and solenoid and tighten bolts to specification.

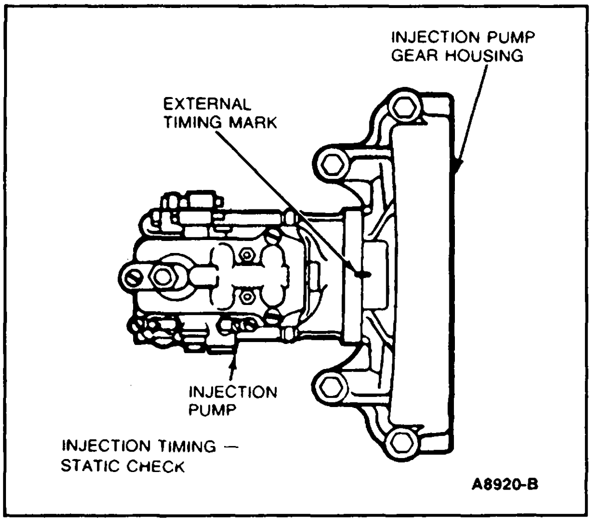

Figure 13 Injection Pump Timing Marks

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Setting Injection Timing — Dynamic Timing

1. Bring engine up to normal operating temperature.

   NOTE: When checking or setting dynamic injection timing on the 7.3L engine it is mandatory that the engine be stabilized at normal operating temperature of 89°C-100°C (192°F-212°F). This temperature is needed to ensure proper fuel ignition in the precombustion chambers.

2. Stop engine and install Dynamic Timing Meter, Rotunda 078-00200 or equivalent, by placing magnetic pickup in timing pointer probe hole (Fig. 14). Insert pickup until it almost touches vibration damper.

   NOTE: To prevent incorrect readings, ensure that vibration damper is clean and free of foreign debris and rust scale. If required, sand the area to remove rust and apply a light coat of paint to the area.

3. Attach clamp from Timing Meter Adapter Rotunda 078-00201 or equivalent, to the line pressure sensor on No. 1 injector nozzle (F-Series) or No. 4 injector nozzle (E-Series) and connect to timing meter (Fig. 15).

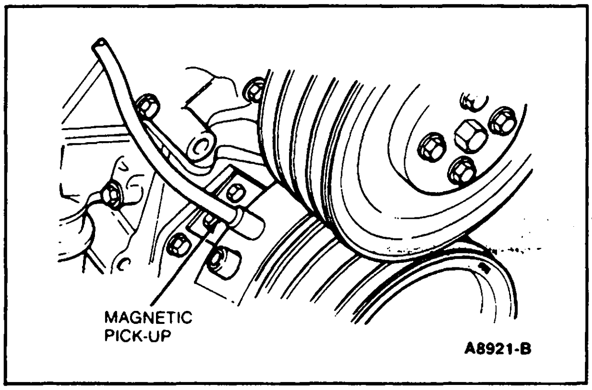

Figure 14 Magnetic Pickup — Dynamic Timing

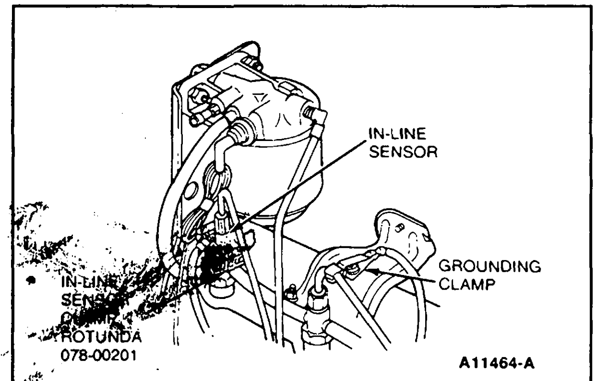

Figure 15 Luminosity Probe — Dynamic Timing

4. Connect dynamic timing meter to battery and dial in minus 20 degrees offset on meter. Disconnect cold start advance solenoid connector from solenoid terminal (Fig. 12).

   NOTE: Ensure that all wire leads are located away from the front accessory drive belts.

5. With transmission in NEUTRAL and rear wheels raised off the ground, start engine. Using Throttle Control Tool D83T-9000-E or equivalent, set engine speed to 2000 rpm with no accessory load. Observe injection timing on dynamic timing meter. Injection timing should be 8.5 degrees BTDC at 2000 rpm.

6. Apply battery voltage to cold start advance solenoid terminal to activate it.

   NOTE: Activating cold start advance solenoid can result in engine speed increase. Adjust throttle control to attain 2000 rpm, if required.

7. Check timing at 2000 rpm. The timing should be advanced at least 1 degree before the timing obtained in Step 5. If the advance is less than 1 degree, replace fuel injection pump top cover assembly.

8. If dynamic timing is not within ± 2 degrees of specification, adjustment of pump timing is necessary.

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Setting Injection Timing — Dynamic Timing

9. Turn engine off. Note timing mark alignment. Remove fast idle bracket and solenoid from injection pump. Break torque (keeping nuts snug) on nuts attaching injection pump to pump mounting adapter with Tool T86T-9000-C or equivalent.

10. Install rotating tool, T83T-9000-C or equivalent, on front of pump. Rotate clockwise (when viewed from front of engine) to retard, and counterclockwise to advance timing, by lightly tapping tool with a rubber mallet. Two degrees of dynamic timing is approximately 0.75mm (.030 inch) of timing mark movement.

11. Remove rotating tool and tighten nuts to specification. Start engine and recheck timing. Repeat Steps 9, 10 and 11 as necessary, to set timing to ± 1 degree of specification.

12. Turn engine off. Remove dynamic timing components. Install fast idle bracket and solenoid and tighten bolts to specification.

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System Description and Diagnosis

This portion of this Section contains a brief description of the 7.3L diesel engine "WAIT TO START" Lamp System, Solid-State Glow Plug System and Fuel Injection System. It also contains detailed diagnostic procedures for these systems.

The diagnostic procedures are broken into two parts. The first part is Symptom Analysis. This Section should be consulted first, as it will provide direction to perform a specific service or to a specific diagnostic procedure.

The second part contains the "WAIT TO START" Lamp, Solid-State Glow Plug System and Engine Performance diagnostic procedures. At the beginning of each of these procedures, there is an explanation of how to use that procedure. Read this explanation before performing the tests.

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Warning Lamps

Wait To Start Lamp

The "WAIT TO START" lamp comes on when the ignition switch is turned to the RUN position, and the engine is below normal operating temperature. It will remain lit for 4 to 10 seconds, depending on engine temperature. If engine is at or above normal operating temperature the lamp will not turn on.

NOTE: If the ignition switch is left in the ON position for an extended period of time or the engine is not started within the two minute cycling time, the glow plug system must be reset by turning the ignition switch to OFF position.

Fuel Filter Restriction Warning Lamp

The 7.3L diesel is equipped with a fuel filter restriction sensor. A restriction indicator lamp is located in the instrument cluster to alert the operator.

If the lamp comes on during normal engine operation, replace the filter as soon as possible.

Water In Fuel Warning Lamp

The "WATER IN FUEL" warning lamp should turn on when the ignition switch is in the START position to indicate proper lamp and sensor function. The lamp will come on if the fuel filter/water separator has a significant amount of water in it. If the lamp comes on during normal engine operation, drain the fuel bowl in the filter as soon as possible. Water in the fuel could cause extensive damage to the fuel injection system.

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Solid-State Glow Plug System

The solid-state glow plug system consists of the glow plug controller, the glow plug harness assembly and glow plugs (Fig. 16).

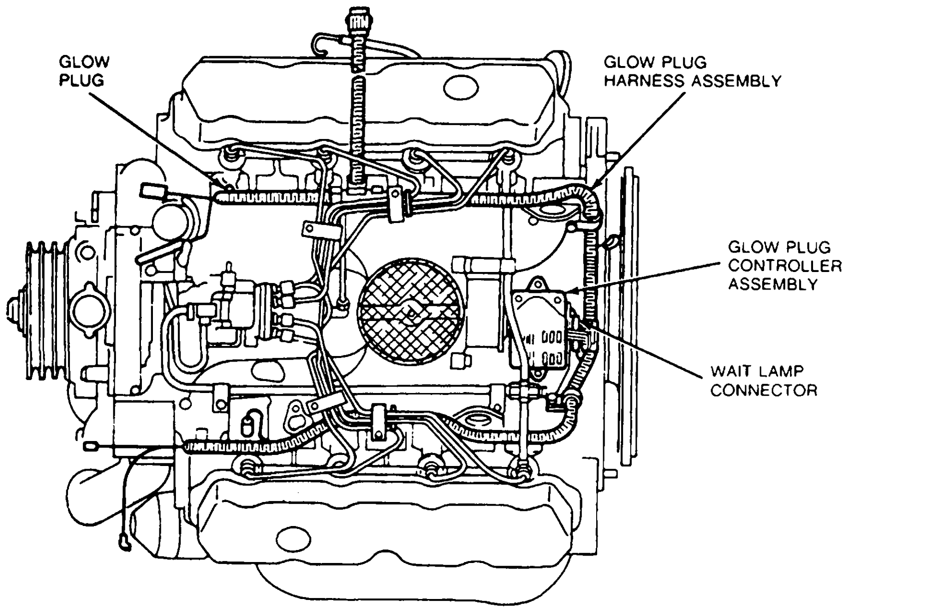

Figure 16 Solid State Glow Plug Control System

The system determines the glow plug temperature by electronically measuring the resistance of the glow plugs. It then maintains this temperature regardless of ambient temperatures.

The system is actuated when the ignition switch is turned to the RUN position. The "WAIT TO START" lamp lights until the glow plugs reach the proper temperature. The lamp goes out and the engine can be started.

The afterglow operation of the glow plugs continues after the "WAIT TO START" lamp turns off. The glow plugs cycle on and off for a period of time. This helps to reduce white smoke after engine start-up.

The glow plug system can be recycled by turning the ignition off and on. This immediately restarts the glow plug cycle. The engine can be started as soon as the "WAIT TO START" lamp goes off.

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Solid-State Glow Plug System

Glow Plug Controller

The power relay is mounted on top of the solid-state controller circuit board. The complete assembly is mounted on the rear of the intake manifold (Fig. 17).

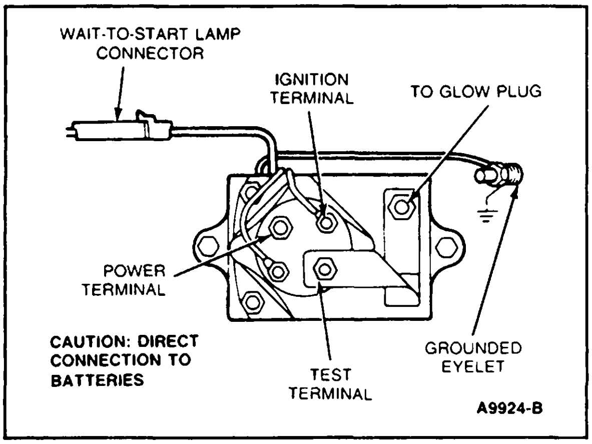

Figure 17 Solid-State Glow Plug Controller

Glow Plugs

The system uses positive temperature coefficient (PTC) glow plugs. The resistance of the glow plugs changes as the temperature rises. The glow plugs use bullet-type terminals (Fig. 18).

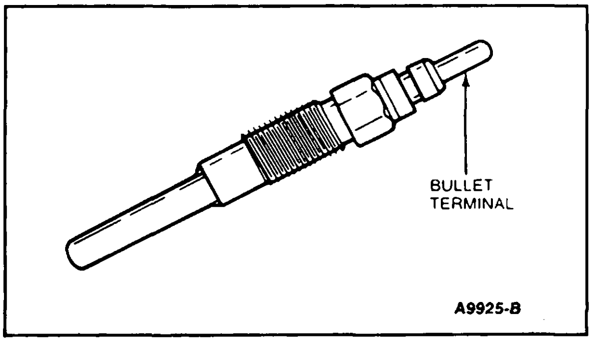

Figure 18 Glow Plugs

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Solid-State Glow Plug System

Wiring Schematic

Use the electrical schematic (Fig. 19) when diagnosing the glow plug system.

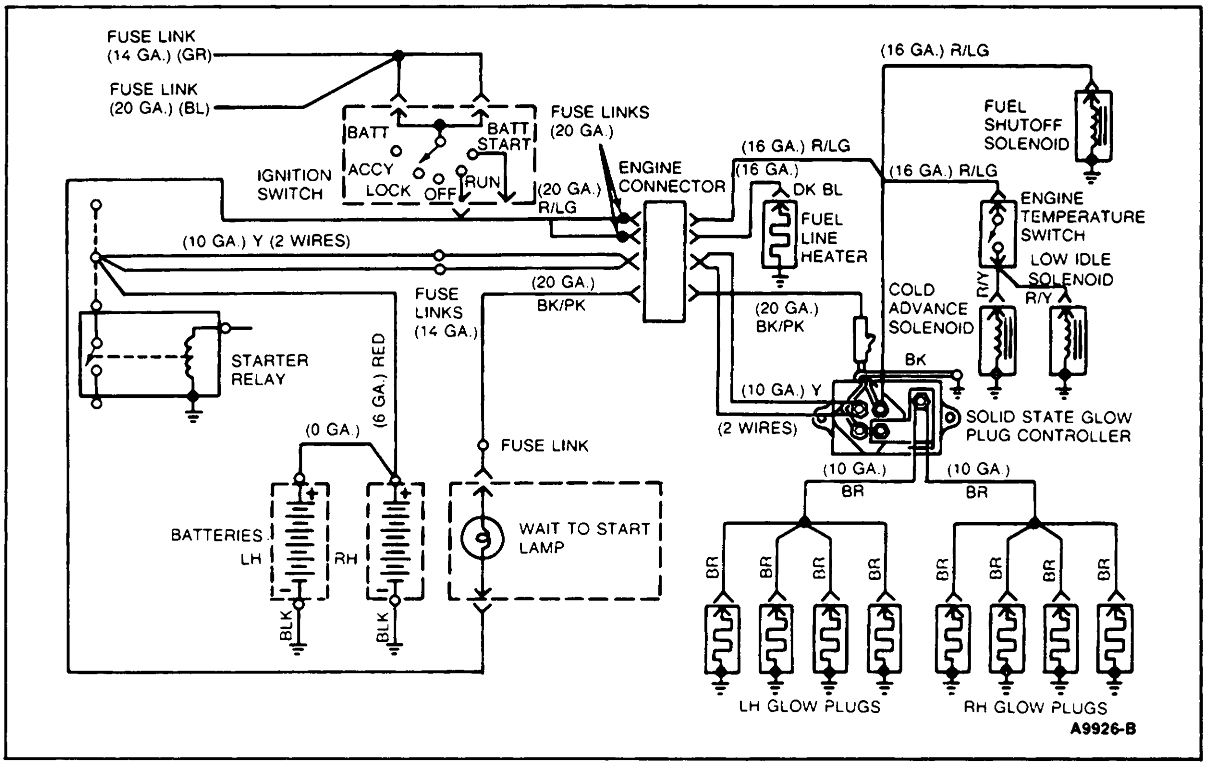

Figure 19 Wiring Schematic

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Fuel System Description

Figure 20 shows a schematic of the fuel supply and return lines. Fuel from the tank is routed to the fuel supply pump which pumps fuel through a combination fuel filter, heater and water separator. The filter header contains a continuous vent (orifice bleed-off system) which aids starting by eliminating the need to manually prime the fuel filter. A vacuum switch is incorporated into the fuel filter header which will activate a light on the instrument panel indicating the need for filter replacement. The water separator portion of the filter assembly has a probe which will activate an instrument panel light when the filter requires draining at the water and sediment drain located on the bottom of the assembly.

Fuel enters the inlet of the injection pump and is delivered under high pressure through injection nozzles into the engine cylinders for combustion. On each nozzle is a fuel return fitting that returns excess fule to the fuel tank. Excess fuel from the injection pump and each injection nozzle are collected in bleed-off lines and returned to the fuel tank.

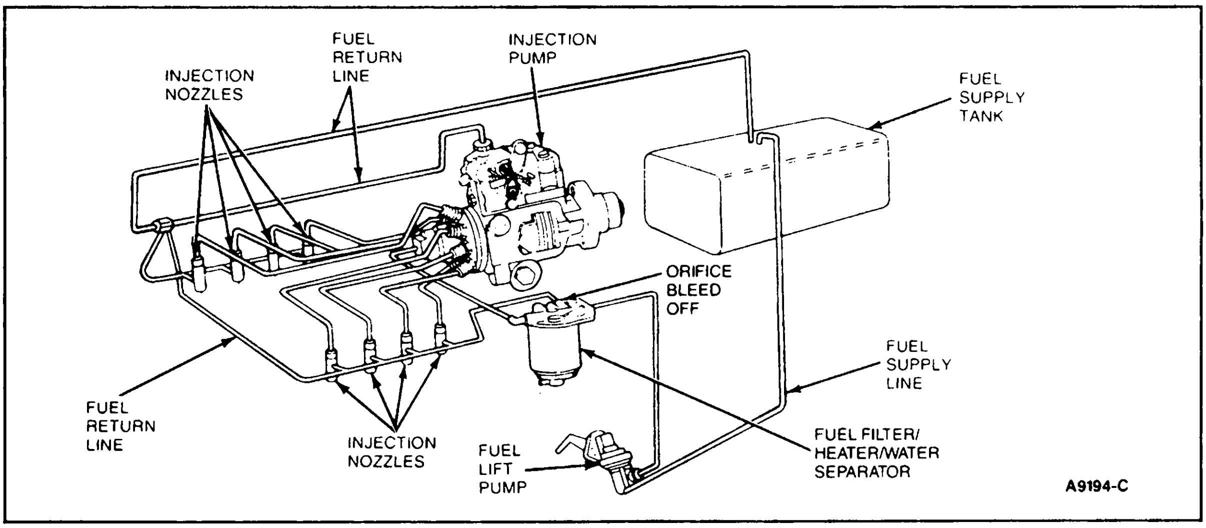

Figure 20 Fuel System Schematic

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Symptom Analysis

Consult the Symptom Analysis Diagnostic Procedures first. These will indicate a service to be performed or provide direction to either the Fast Start Glow Plug System Diagnostic Procedure or the Engine Performance Diagnostic Procedure.

If the GLOW PLUG lamp is suspected of being faulty, go directly to the GLOW PLUG diagnostic procedure before performing the Glow Plug System Diagnostic Procedure.

If the problem is Loss of Power and/or Increased Fuel Consumption, go directly to the Engine Performance Diagnostic Procedure.

Evaluating "Normal" Diesel Engine Exhaust Smoke

The following is a description of what is "normal" and expected exhaust smoke for a vehicle with a diesel engine. Diesel exhaust smoke can be classified into two categories according to the color of the smoke.

The first category is blue-white smoke.

- Blue-white smoke may be observed at engine start-up whether the engine is up to operating temperatures or not. This start-up smoke will be observed at all ambient temperatures and should last no longer than a minute after the vehicle is driven.
- When ambient temperature is below 10°C (50°F), blue-white smoke can return after the engine warm-up due to extended idling. This is due to the combustion chambers cooling down during periods of extended idling time.

Heavy blue-white smoke will also occur when the engine is operated at wide-open throttle (accelerator pedal to the floor) with the transmission in NEUTRAL or with a lightly loaded vehicle in any transmission gear setting. The smoke is a normal characteristic for a diesel engine with a light min.-max. governor spring in the fuel injection pump. This results in the following characteristics due to the engine operating above its rated speed (3300 rpm) in a no-load or lightly loaded condition:

- Heavy blue-white smoke.
- Fuel injection pump governor hunting resulting in high speed engine rpm surging.
- Engine sputtering or misfiring.

The conditions can be eliminated by not operating the engine above its maximum full load rated speed of 3300 rpm.

NOTE: Chassis fuel system air leaks may also cause continuous heavy blue-white smoke.

The second category of diesel exhaust smoke is black smoke. Black smoke occurs whenever the engine is working hard. The engine works hard when it is going up a steep grade, pulling a trailer, carrying a heavy load, or during acceleration. More black smoke will be observed when operating the vehicle at higher altitudes. If black smoke is observed while the engine is idling (at low altitude) or under normal driving conditions, the problem should be diagnosed as soon as possible.

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Engine Cranks But Will Not Start (Cold)

TEST STEP	RESULT ▶	ACTION TO TAKE
A0 STARTING PROCEDURE		
NOTE: If the ignition key is left in the ON position for an extended period of time or the engine is not started within the two minute cycling time, the glow plug system must be reset by turning the ignition key to OFF position. • Check and follow correct starting procedure on vehicle visor.	OK ▶ ~~OK~~ ▶	RETURN vehicle to customer. GO to **A1**.
A1 GLOW PLUG MODULE RELAY		
• Open hood. • Listen for glow plug module relay click when ignition switch is turned to ON position.	OK ▶ ~~OK~~ ▶	GO to **A2**. GO to Glow Plug System Diagnostic Procedure.
A2 FUEL FLOW CHECK		
• Loosen one injection nozzle line nut (1/2 to one turn) while cranking engine.	Fuel discharges ▶ Fuel does not discharge ▶	GO to Glow Plug System Diagnostic Procedure. GO to **A3**.
A3 ENERGIZE TO RUN SOLENOID (ETR)		
• Check voltage at ETR solenoid (terminal located at front of injection pump) while cranking engine. Voltage must be at least 9 volts. • Check solenoid terminal for dirt/corrosion and loose/broken electrical connection.	OK ▶ ~~OK~~ ▶	GO to **A4**. REFER to Shop Manual, Section 31-01. REPEAT Test Step **A3**.
A4 CHECK COLD IDLE SPEED/ADVANCE		
• Check voltage at cold advance solenoid (terminal located at left rear of injection pump) while cranking engine. Voltage must be at least 9 volts. • If no voltage is present, verify switching function of temperature sensing switch located behind thermostat housing.	OK ▶ ~~OK~~ ▶	GO to Engine Performance Diagnostic Procedure. REFER to Shop Manual, Section 31-01. REPEAT Test Step **A4**.

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Engine Cranks But Will Not Start (Normal Operating Temperature)

TEST STEP	RESULT ▶	ACTION TO TAKE
B0 STARTING PROCEDURE		
• Check and follow correct starting procedure on vehicle visor.	OK ▶	RETURN vehicle to customer.
	~~OK~~ ▶	GO to **B1**.
B1 FUEL FLOW CHECK		
• Loosen one injection nozzle line nut (1/2 to one turn) while cranking engine.	Fuel discharges ▶	GO to Engine Performance Diagnostic Procedure.
	Fuel does not discharge ▶	GO to **B2**.
B2 ENERGIZE-TO-RUN SOLENOID (ETR)		
• With ignition switch in the ON position, check voltage at ETR solenoid (terminal at front of injection pump). Voltage must be at least 9 volts. • Check solenoid terminal for dirt/corrosion and loose/broken electrical connection.	OK ▶	GO to Engine Performance Diagnostic Procedure.
	~~OK~~ ▶	REFER to Shop Manual, Section 31-01. REPEAT Test Step **B2**.

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Engine Quits, Stalls or Stumbles

TEST STEP	RESULT ▶	ACTION TO TAKE
C0 IDLE SPEED		
• Perform Test Step EPC.10 in the Engine Performance Diagnostic Procedure.	OK ▶	GO to C1 .
	~~OK~~ ▶	ADJUST idle speed as described in this Section, under Adjustments.
C1 ENERGIZE-TO-RUN SOLENOID (ETR)		
• Check ETR solenoid (terminal located at left front of injection pump) for dirt/corrosion and loose/broken electrical connection. While cranking, voltage must be at least 9 volts.	OK ▶	GO to C2 or C3 as required.
	~~OK~~ ▶	CLEAN, SERVICE or REPLACE terminal connection. REFER to Shop Manual, Section 31-01. REPEAT Test Step C1 .
C2 COLD ADVANCE SYSTEM (COLD ENGINE)		
• Check voltage at cold advance solenoid (terminal located at left rear of injection pump) while cranking engine. Voltage must be at least 9 volts. • If no voltage is present, verify switching function of temperature sensing switch located behind thermostat housing.	OK ▶	GO to Engine Performance Diagnostic Procedure.
	~~OK~~ ▶	REFER to Shop Manual, Section 31-01. REPEAT Test Step C2 .
C3 COLD ADVANCE SYSTEM (HOT ENGINE)		
• Check for voltage at cold advance solenoid (terminal located at left rear of injection pump) while cranking engine. No voltage should be present.	OK ▶	GO to Engine Performance Diagnostic Procedure.
	~~OK~~ ▶	REPLACE temperature sensing switch. REPEAT Test Step C3 .

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Engine Misses

TEST STEP	RESULT ▶	ACTION TO TAKE
D0 DETERMINE WHEN MISS OCCURS		
• Engine will miss when cold if one or more glow plugs are not heating.	Engine misses only when cold ▶	REFER to Glow Plug System Diagnostic Procedure.
	Engine misses at normal operating temperature ▶	GO to D1.
D1 ISOLATE MISS		
• Loosen each injection nozzle line nut (one at a time) while running engine. Refer to Injection Nozzle Testing in this Section.	Miss not isolated to specific cylinder ▶	GO to Engine Performance Diagnostic Procedure.
	Miss isolated to specific cylinder(s) ▶	GO to D2.
D2 CHECK NOZZLE FUEL DELIVERY		
• Check injection nozzle fuel line(s) for kinks or restrictions as described in Shop Manual, Section 22-08. • Perform injection nozzle test as described under Injection Nozzle Testing in this Section.	Nozzle(s) and lines OK ▶	GO to D3.
	Nozzle(s) and/or lines Not OK ▶	REPLACE defective line(s) as described in Shop Manual, Section 22-08. REPLACE nozzle(s) as described under Injection Nozzle Testing in this Section.
D3 CYLINDER COMPRESSION CHECK		
• Perform cylinder compression test as described in Shop Manual, Section 22-08.	OK ▶	GO to Engine Performance Diagnostic Procedure.
	~~OK~~ ▶	GO to D4.
D4 CHECK CRANKCASE PRESSURE		
• Perform Engine Performance Diagnostic Procedure Test Step EPC.12.	OK ▶	SERVICE or REPLACE valve train as described in Shop Manual, Section 22-08.
	~~OK~~ ▶	OVERHAUL power cylinder as described in Shop Manual, Section 22-08.

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Engine Knocks

TEST STEP	RESULT ▶	ACTION TO TAKE
E0 BELT DRIVEN ACCESSORIES		
• Check engine front drive components for proper operation.	OK ▶	GO to E1.
	Not OK ▶	SERVICE or REPLACE as necessary. REFER to specific accessory Shop Manual Section.
E1 ENGINE COOLANT TEMPERATURE		
• Verify engine is not overheating.	OK ▶	GO to E2.
	Not OK ▶	REFER to Shop Manual, Section 27-02.
E2 ISOLATE ENGINE KNOCK		
• Loosen each injection nozzle line nut (one at a time) while running engine. Refer to Injection Nozzle Testing.	Engine knock not isolated to specific cylinder ▶	GO to Engine Performance Diagnostic Procedure.
	Engine knock isolated to specific cylinder(s) ▶	GO to E3.
E3 CHECK NOZZLE FUEL DELIVERY		
• Check injection nozzle fuel line(s) for kinks or restrictions as described in Shop Manual Section 22-08.	Nozzle(s) and lines OK ▶	GO to Engine Performance Diagnostic Procedure.
• Perform injection nozzle test as described under Injection Nozzle Testing.	Nozzle(s) and/or lines not OK ▶	REPLACE defective line(s) as described in Shop Manual, Section 22-08. REPLACE nozzle(s) as described under Injection Nozzle Testing.

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Low Oil Pressure With Proper Oil Level

TEST STEP	RESULT ▶	ACTION TO TAKE
F0 OIL PRESSURE TRANSDUCER		
o Verify accuracy of oil pressure transducer. Use Adapter 5633 with Pressure Test Kit 014-00761 or equivalent. Refer to Pressure Test Kit hookup illustration in this Section.	OK ▶	GO to F1 .
	~~OK~~ ▶	REPLACE transducer. REPEAT Test Step F0 .
F1 CHANGE ENGINE OIL AND FILTER		
o Change engine oil and filter and run engine until normal operating temperature is reached. Check oil pressure reading.	OK ▶	RETURN vehicle to customer.
	~~OK~~ ▶	SERVICE or REPLACE lubrication system components as necessary. (REFER to Shop Manual, Section 22-08.)

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Blue/White Smoke (Engine At Normal Operating Temperature)

TEST STEP	RESULT ▶	ACTION TO TAKE
G0 ENGINE TEMPERATURE		
NOTE: Refer to Symptom Analysis. • Verify that engine stabilizes in normal operating range.	OK ▶ ~~OK~~ ▶	GO to G2. GO to G1.
G1 THERMOSTAT OPERATION		
• Remove thermostat. (Refer to Shop Manual, Section 22-08.) • Test thermostat for proper operation. (Refer to Shop Manual, Section 22-08.)	OK ▶ ~~OK~~ ▶	REPLACE thermostat housing with integral air bleed check valve. REPEAT Test Step G0. REPLACE thermostat. (REFER to Shop Manual, Section 22-08). REPEAT Test Step G0.
G2 EXCESSIVE OIL LEVEL		
• Check engine oil level indicator for excessive oil fill.	OK ▶ ~~OK~~ ▶	GO to G3. DRAIN excess oil from oil pan. If problem still exists, GO to G3.
G3 FUEL RETURN		
• Perform fuel return pressure test as described in Test Step EPC.5 of the Engine Performance Diagnostic Procedure.	OK ▶ ~~OK~~ ▶	PERFORM entire Engine Performance Diagnostic Procedure. SERVICE or REPLACE fuel return line(s) as necessary. (Refer to Shop Manual, Section 24-50.) REPEAT Step G3.

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Excessive Black Smoke

TEST STEP	RESULT ▶	ACTION TO TAKE
H0 VERIFY SMOKE LEVEL		
NOTE: Refer to Symptom Analysis • Verify under what conditions black smoke occurs.	Light load and/ or low altitude ▶	GO to H1. **NOTE: For warranty claim approval, Engine Performance Chart must be filled out for the following steps: EPC.2; EPC.6; EPC.11; EPC.13**
	Under heavy load ▶	Normal when going up steep grades, pulling a trailer, maximum load, maximum acceleration or at high altitudes.
H1 EXHAUST SYSTEM CONDITION		
• Complete Test Step EPC.2 of Engine Performance Diagnostic Procedure, and record problem description and results on Engine Performance Chart.	OK ▶	GO to H2.
	~~OK~~ ▶	SERVICE or REPLACE exhaust system as necessary. (REFER to Shop Manual, Section 26-01.) If problem still exists, GO to H2.
H2 CHECK AIR CLEANER RESTRICTION		
• Complete Test Step EPC.6 of Engine Performance Diagnostic Procedure and record results on Engine Performance Chart.	OK ▶	GO to H3.
	~~OK~~ ▶	REPLACE air filter element and/or SERVICE system. REPEAT Test Step H2.

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Excessive Black Smoke

TEST STEP	RESULT ▶	ACTION TO TAKE
H3 INJECTION PUMP TIMING		
• Complete Test Step EPC.10 of Engine Performance Diagnostic Procedure and record results on Engine Performance Chart.	OK ▶	GO to H4.
	~~OK~~ ▶	ADJUST timing. (REFER to Adjustments in this Section.) If problem still exists, GO to H4.
H4 INJECTION NOZZLES		
• Complete Test Step EPC.11 of Engine Performance Diagnostic Procedure and record results on Engine Performance Chart.	OK ▶	REPLACE injection pump as described in Shop Manual, Section 22-08.
	~~OK~~ ▶	REPLACE damaged injection nozzle fuel inlet lines (REFER to Shop Manual, Section 22-08). REPLACE nozzles as described in this Section, and Shop Manual, Section 22-08. If problem still exists, REPLACE injection pump as described in Shop Manual, Section 22-08.

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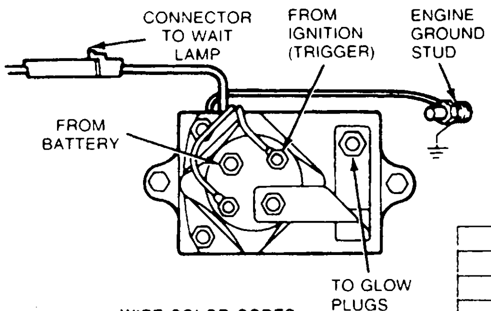
Solid-State Glow Plug System Diagnostic Procedure

Perform the Glow Plug System Basic Diagnostic Test (hereafter referred to as Basic Test) first. If the vehicle passes the Basic Test without running any Pinpoint Tests, the Glow Plug system is OK and the vehicle's problem exists somewhere else other than the Glow Plug System. However, if a step of the Basic Test fails, run only the Pinpoint Test specified by the failed step.

Refer to Figure 21 for test lamp connections and Glow Plug System wiring harness test points referred to in the Basic Test and the Pinpoint Tests. Perform only those services specified by the Pinpoint Tests.

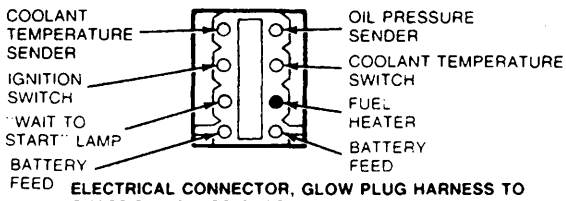
Operation of the Glow Plug System is completely automatic. If, after completing a specific Pinpoint Test it is determined that a component must be replaced, the glow plugs should be disconnected until system has been re-checked by repeating the Basic Test to make sure the Glow Plug System works properly.

A Fast Start Glow Plug System Troubleshooting Chart is available for use by technicians. The technician can use it as a check list while performing tests and diagnostic procedures.



WIRE COLOR CODES

TERMINAL	COLOR
TRIGGER	DK. BLUE
GROUND	RED/WHITE
BATTERY	YELLOW
GLOW PLUGS	(LH) ORANGE/WHITE (RH) BROWN
WAIT LAMP	BLACK/PINK



ELECTRICAL CONNECTOR, GLOW PLUG HARNESS TO CHASSIS HARNESS CHASSIS SIDE VIEW

TERMINAL	WIRE COLOR CODES
IGNITION SWITCH	RED W/LIGHT GREEN STRIPE
"WAIT TO START" LAMP	BLACK W/PINK STRIPE
BATTERY FEED	YELLOW
BATTERY FEED	YELLOW
OIL PRESSURE SENDER	WHITE W/RED STRIPE
COOLANT TEMPERATURE SENDER	RED W/WHITE STRIPE
COOLANT TEMPERATURE SWITCH	RED W/BLACK STRIPE
IGNITION LEAD TO FUEL HEATER	DARK BLUE

A9882-C

Figure 21 Glow Plug System Diagnostic Test Points

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Glow Plug Pinpoint Testing

The following is a series of Pinpoint Tests that can be used to diagnose the glow plug system.

CAUTION

Never bypass the timed pulse function of the glow plug system. A constant 12 volt current to the glow plugs will cause them to overheat and fail within seconds, possibly resulting in severe engine damage.

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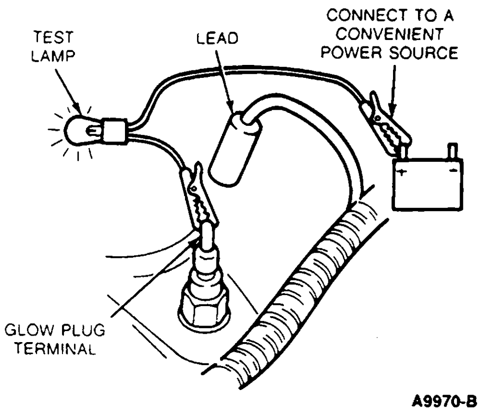
Glow Plug Testing

Pinpoint Test A

TEST STEP	RESULT ▶	ACTION TO TAKE
A1 CHECK GLOW PLUGS		
o Ignition switch in OFF position and leads removed from glow plugs. o Check continuity between glow plug terminal and a power source with glow plugs installed in engine. 	OK ▶ ~~OK~~ ▶	GO to A2. REPLACE plug(s). GO to A2.

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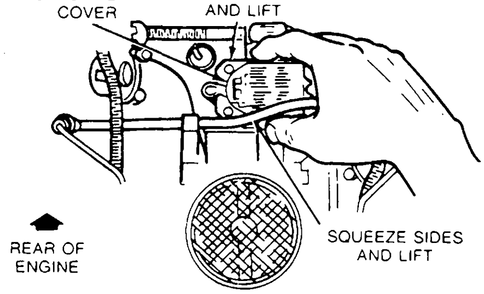
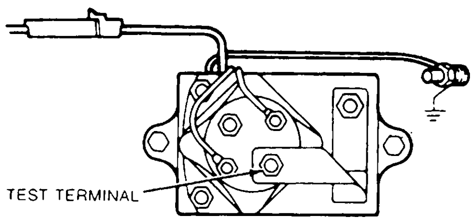
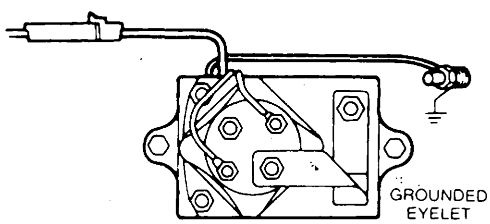
Glow Plug Testing

Pinpoint Test A

TEST STEP	RESULT ▶	ACTION TO TAKE
A2 CHECK HARNESS		
• Ignition switch in OFF position and leads removed from glow plugs. • Squeeze sides of protective cover and remove. • Check continuity between each glow plug lead and test terminal of control unit.  	OK at all leads ▶ Not OK at any or all leads ▶	GO to A3. SERVICE or REPLACE harness. GO to A3.
A3 CHECK CONTROL UNIT		
• Ignition switch in OFF position. • Contact ohmmeter to ground wire terminal eyelet and to ground post on each battery. 	Less than 1 ohm ▶ More than 1 ohm ▶	GO to A4. CLEAN or SERVICE ground connection. REPEAT check. GO to A4.

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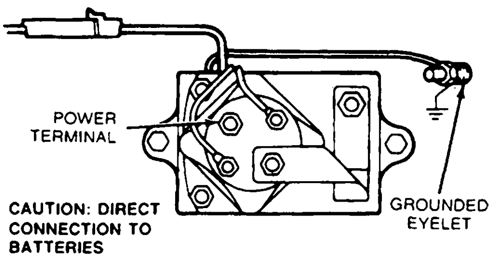
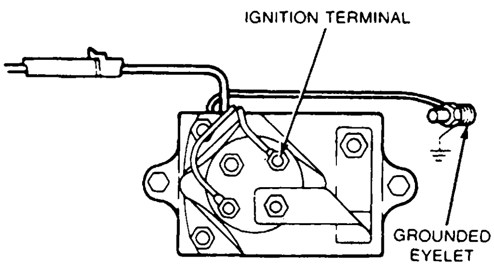
Glow Plug Testing

Pinpoint Test A

TEST STEP	RESULT ▶	ACTION TO TAKE
A4 CHECK SUPPLY VOLTAGE		
• Ignition switch in OFF position. • Connect voltmeter to control unit power terminal and ground.  A9974-B	More than 10 volts ▶	GO to A5.
	Less than 10 volts ▶	SERVICE wiring or RECHARGE battery. GO to A5.
A5 CHECK VOLTAGE FROM IGNITION SWITCH		
• Check voltmeter to Ignition Terminal on control unit and ground. • Turn ignition switch to ON position and all accessories off.  A9975-B	More than 8 volts ▶	GO to A6.
	Less than 8 volts ▶	CHECK fusible link, SERVICE wiring or RECHARGE battery. GO to A6.

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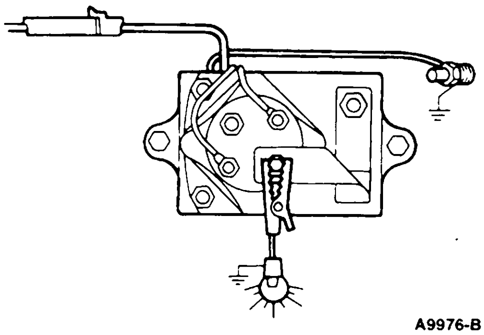
Glow Plug Testing

Pinpoint Test A

TEST STEP	RESULT ▶	ACTION TO TAKE
A6 FUNCTIONAL TEST		
• With ignition switch in OFF position connect 12 volt test light to test terminal on control unit. • Position test light so it can be viewed from driver's position. • Turn ignition switch to ON position and monitor system operation. • Compare test light times to Test Light Chart.	Test light times within specifications ▶	System function is correct.
	Test light times out of specifications ▶	DISCONNECT power at both batteries. REPLACE control unit. REPEAT test.



A9976-B

TEST LIGHT CHART

NOTE: Total Test Light "ON" Time includes time from the beginning of the initial "ON" cycle" to the end of the last "ON-OFF cycle" measured in seconds.

Control* Unit Temp. °F	"Wait-to-Start" Lamp "ON" Time (Sec.)	Test Light Total Time (Sec.)
- 20°C	7-15	35-70
0°F	7-12	25-60
35°F	5-12	15-35
70°F	3-5	7-15
105°F	1-3	3-5
140°F	1 or Less	1-3

* Temperature of Control Unit, NOT ambient temperature

NOTE: The "Wait-to-Start" Lamp and/or Test Light may not illuminate if engine temperature is at or near normal operating temperature.

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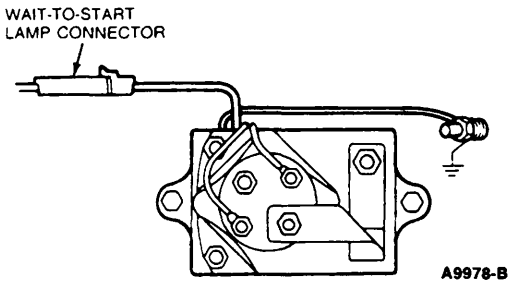
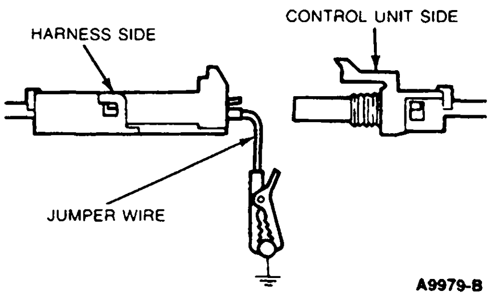
"Wait-To-Start" Lamp Testing

Pinpoint Test B

TEST STEP	RESULT ▶	ACTION TO TAKE
B1 "WAIT-TO-START" LAMP STAYS ON		
o Disconnect the "wait-to-start" lamp connector at control unit. o Turn ignition switch to ON position.	Lamp On ▶	SERVICE wiring to lamp.
	Lamp Off ▶	DISCONNECT power at both batteries. REPLACE control unit.
B2 "WAIT-TO-START" LAMP DOES NOT GO ON		
o Disconnect the "wait-to-start" lamp connector at control unit. o Connect jumper wire from harness side to ground. o Turn ignition switch to ON position.	Lamp On ▶	GO to Hard Starting Checks.
	Lamp Off ▶	REPLACE bulb or SERVICE wiring.





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Glow Plug Failure Analysis

The following are examples of glow plug failure. Each example gives a different clue to glow plug failure analysis.

- There is no visible damage, but glow plug is electrically open (Fig. 22). This indicates an internal heating element failure.
- Glow plug tip that is missing can be caused by incorrect timing or poor fuel quality (Fig. 23).
- Multiple, distorted glow plugs are usually caused by electrical overheating (Fig. 24). A complete evaluation of the glow plug control system should be made.

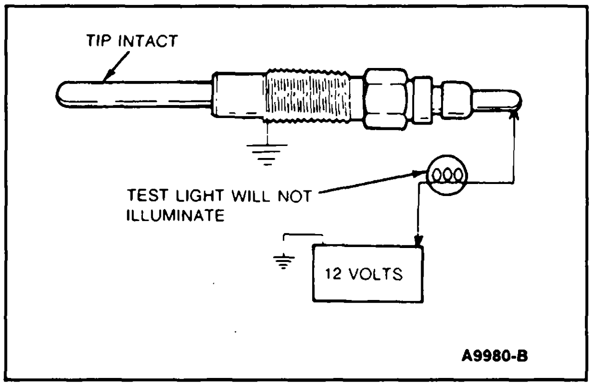

Figure 22 Electrically Open

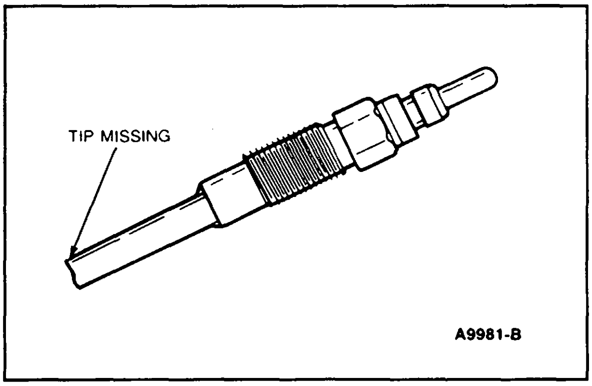

Figure 23 Missing Tips

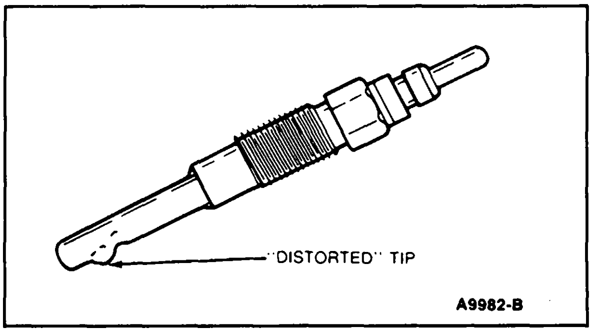

Figure 24 Distorted Tips

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Engine Performance Diagnostic Procedure

The Engine Performance Diagnostic Procedure begins with those items which are the high frequency, easy-to-diagnose problems, and progresses to the low frequency, hard to diagnose problems. Use of this procedure will promote rapid as well as accurate diagnosis.

The Engine Performance Diagnostic Procedure follows, step by step, the Engine Performance Chart. Each test step is labeled to coincide with the Engine Performance Chart steps.

NOTE: Under no circumstances should the fuel injection pump be replaced until the Engine Performance Chart has been completely filled out. The only exceptions to this is in the case of Excessive Black Smoke (Symptom Analysis Diagnostic Procedure H) and external leaks. In these cases, only those steps specified need to be filled out. Warranty claims for the fuel injection pump or injectors will not be accepted unless the Engine Performance Chart is filled out as specified and all tamperproof seals are intact.

NOTE: Service each problem detected before going on to the next step. If service corrects the original complaint, it will not be necessary to proceed to the next test step. However, if the complaint is not corrected, continue with the test until the complaint is corrected.

The following explanations refer to the basic test steps of the Engine Performance Diagnostic Procedure and Chart. They give a brief description of how these problems can affect performance, and an understanding of the importance of each test step.

1. External Leakage: Fuel leakage can be a reason for diesel fuel smell or low economy. Oil leakage can be a reason for high oil consumption. An air intake system leak can shorten engine life, especially under dusty conditions. Coolant leakage can result in engine overheating.
2. Exhaust System Condition: Kinks or dents in the exhaust system can cause high exhaust back pressure. This can result in loss of power and high smoke levels.
3. Fuel Quality: Diesel engines need clean fuel, free of air, dirt and water. Any contamination may result in poor engine performance.
4. Fuel System Condition: Kinks in the fuel lines or hoses can block or restrict fuel flow and loose connections can leak air into the fuel. This can result in loss of power and high smoke levels.

   NOTE: The fuel supply system must deliver the proper quantity of fuel with no pressure loss or air leaks in chassis fuel system.
5. Fuel System Return Line Restriction: A restriction in the fuel return line will raise the pressure in the injection pump causing an adverse effect on injection pump timing, resulting in excessive smoke levels or loss of power.
6. Air Cleaner Restriction: A dirty air cleaner may result in low power, excessive smoke and poor fuel economy.
7. Transfer Pump Pressure: This is the pressure which is available to charge the injection plunger. Low pressure will result in low power, and excessive smoke levels.
8. Accelerator Linkage: If the accelerator linkage is improperly adjusted, the engine cannot reach full rated rpm and top speed and pulling power will be reduced, or curb idle speed will be excessive.

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Engine Performance Diagnostic Procedure

9. Engine Idle Speed: Low engine idle speed may cause stalling or rough running.
10. Injection Timing: Incorrect timing can be responsible for poor fuel economy, rough idling or hard starting and excessive smoke.
11. Injection Nozzle Test: The injection nozzles must be removed from the engine for this test. This is a functional test of injection nozzle performance. Incorrect nozzle performance will cause misses, poor fuel economy, loss of power and excessive smoke.
12. Crankcase Pressure: This test measures the amount of crankcase blow-by. More blow-by will create high pressures. Crankcase pressure readings, plus rate of oil consumption, should be used to evaluate engine mechanical condition.

To perform the Engine Performance Diagnostic Procedure it will be necessary to connect the Pressure Test Kit, Rotunda 014-00761 or equivalent, to the various components as shown in Figure 25.

NOTE: If the problem is hard starting, follow the procedures for troubleshooting the glow plug system prior to troubleshooting the fuel system.

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Engine Performance Diagnostic Procedure

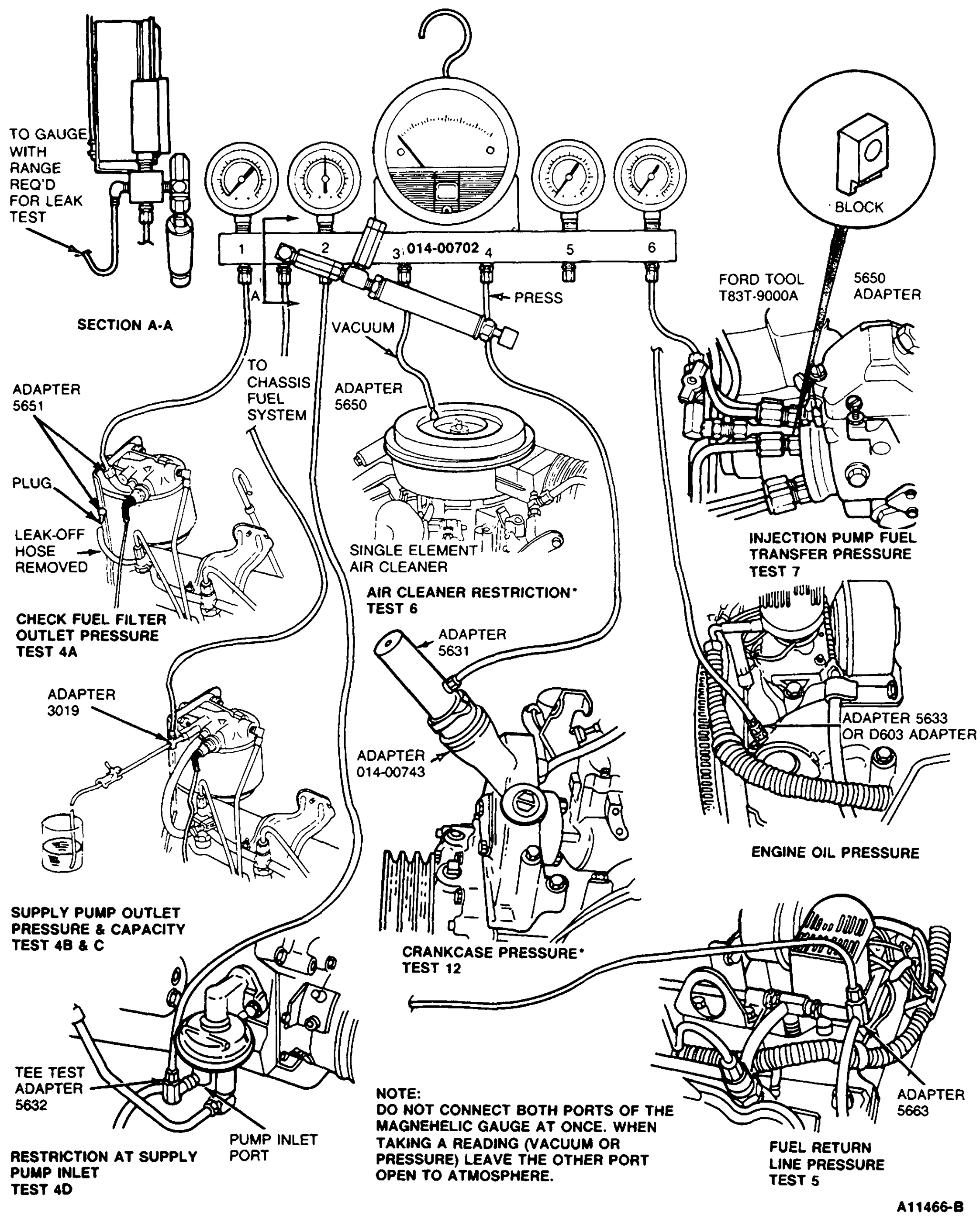

Figure 25 Pressure Test Kit Hookup — Rotunda Model 014-00761

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Engine Performance

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC.1 CHECK FOR EXTERNAL LEAKAGE		
• With engine running, visually check for leakage of: 1. Fuel 2. Engine oil 3. Proper installation and dirt past air cleaner 4. Coolant	No leakage ▶	GO to EPC.2 .
	Leakage detected ▶	SERVICE or REPLACE faulty component(s). If problem still exists, GO to EPC.2 .
EPC.2 CHECK EXHAUST SYSTEM		
• Visually check exhaust system for dents or kinks which could cause restriction.	OK ▶	GO to EPC.3A .
	~~OK~~ ▶	SERVICE or REPLACE exhaust system as required. (Refer to Shop Manual, Section 26-01.) GO to EPC.3A .
EPC.3A CHECK FOR AIR IN FUEL		
• Install a length of clear PVC hose in place of rubber hose between fuel filter outlet and injection nozzle return system. • Run engine for two minutes. Then, run engine at 3,000 rpm and check for bubbles in clear hose. **NOTE: Correct direction of fuel flow is from fuel filter toward fuel return system. Fuel flow in opposite direction is indication of restriction in fuel supply system.** **NOTE: On vehicles with dual fuel tanks, check with tank selector switch in each position for a minimum of two minutes.**	Fuel flow direction OK, bubbles less than 1.58mm (1/16 inch) diameter. ▶	GO to EPC.3B .
	Fuel flow direction OK, bubbles 1.58mm (1/16 inch) diameter or larger ▶	GO to Fuel System Air Leak Diagnosis in this Section. REPEAT Test Step EPC.3A when air leaks are eliminated.
	Fuel flow direction not OK ▶	GO to EPC.5A . REPEAT EPC.3A , when fuel flow direction is corrected.
EPC.3B CHECK FUEL FOR CONTAMINATION		
• Obtain a fuel sample and visually examine fuel in a clear container (including bottom of container), for particles, clouding, or liquid contamination, such as water.	OK ▶	Go to EPC.3C .
	~~OK~~ ▶	REPLACE fuel filter. CLEAN and/or SERVICE fuel system as required. Refer to Shop Manual, Section 24-50. GO to EPC.3C .

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Engine Performance

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC.3C CHECK FUEL FOR CETANE VALUE		
∘ Check cetane value of fuel sample taken in Test Step EPC.3B using cetane tester included with Dynamic Timing Meter, 078-00200 or equivalent. ∘ Cetane value should be minimum of 40.	More than 40 ▶	GO to EPC.4A .
	Less than 40 ▶	Complete Tests EPC.4, 5, 6 and 8. INFORM owner* to change fuel source. GO to EPC.4A . ***NOTE: Do not replace fuel injection pump because of low cetane problem.**
EPC.4A FUEL FILTER OUTLET PRESSURE		
∘ Remove air bleed orifice hose from fuel filter fitting. ∘ Install adapter 5651 with Pressure Test Kit 014-00761, or equivalent. (Refer to Pressure Test Kit Hook-Up Illustration.) ∘ Run engine at 3,300 rpm, with no load. ∘ Record pressure reading. On dual tank vehicles, check both tanks. ∘ Pressure should be minimum of 1 psi at 3,300 rpm.	OK ▶	GO to EPC.4C .
	NOT OK ▶	GO to EPC.4B .
EPC.4B FUEL SUPPLY PUMP OUTLET PRESSURE		
∘ Remove vacuum purge valve from fuel filter adapter. ∘ Install adapter 3019 and Pressure Test Kit 014-00761, or equivalent. (Refer to Pressure Test Kit Hook-Up Illustration.) **NOTE: Make sure clamp is closed on sampling hose.** ∘ Leave adapter from Test Step EPC.4A installed and cap end. ∘ Run engine at idle, no load. ∘ Record pressure reading. On dual tank vehicles, check both tanks. ∘ Pressure should be minimum of 2 psi at idle.	OK ▶	REPLACE fuel filter and REPEAT Test Step EPC.4A .
	NOT OK ▶	GO to EPC.4C .

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Engine Performance

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC.4C FUEL PUMP CAPACITY		
• Position end of sample hose on adapter 3019 in a clear, one quart, graduated fuel container. • Follow procedures for Test Step **EPC.4B** and open clamp on sample hose, allowing fuel to flow into fuel container, for 30 seconds. • Record volume. On dual tank vehicles, check both tanks. • Volume should be a minimum of one pint in 30 seconds at idle, no load.	Pressure and volume OK ▶	GO to **EPC.5**.
	Pressure OK Volume Not OK ▶	GO to **EPC.4D**.
	Volume OK Pressure Not OK ▶	REPLACE fuel supply pump and REPEAT Test Step **EPC.4A**.
	Pressure and Volume Not OK ▶	GO to **EPC.4D**.
EPC.4D CHECK RESTRICTION AT FUEL SUPPLY PUMP		
• Connect fuel return line removed in Test Step **EPC.4A**. • Install adapter 5632 and Pressure Test Kit to fuel supply pump inlet. • With rear wheels off the ground and transmission in NEUTRAL or PARK, run engine at 3,300 rpm. • Record vacuum reading. On dual tank vehicles, check both tanks. • Vacuum should be less than 6 in-Hg.	OK ▶	GO to **EPC.4A**.
	~~OK~~ ▶	SERVICE or REPLACE restricted chassis fuel line(s). Refer to Shop Manual, Section 24-50. REPEAT Test Step **EPC.4A**.
EPC.5 CHECK FUEL RETURN PRESSURE		
• Remove fuel return line at junction fitting at left rear of engine. • Install adapter 5663 and Pressure Test Kit 014-00761, or equivalent. • Run engine at 3,300 rpm, no load, transmission in NEUTRAL or PARK. • Record pressure reading. On dual tank vehicles, check both tanks. • Maximum pressure should not exceed 2 psi at 3,300 rpm. **NOTE: Fuel return hose removed in EPC.4A must be connected for this test.**	OK ▶	GO to **EPC.6**.
	~~OK~~ ▶	SERVICE or REPLACE fuel return line(s) as necessary. REFER to Shop Manual, Section 24-50. REPEAT Test Step **EPC.5**.

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TEST STEP	RESULT ▶	ACTION TO TAKE
EPC.6 CHECK AIR INTAKE RESTRICTION		
• Remove cap on air cleaner test port and install adapter 5650 and Pressure Test Kit 014-00761, or equivalent. • Run engine at 3,300 rpm, no load. • Record restriction reading. • Restriction should not exceed 25 inches of H_2O.	More than 2 inches H_2O but less than 25 inches H_2O ▶	REMOVE adapter. INSTALL cap on air cleaner port. GO to **EPC.7**.
	25 inches H_2O or more ▶	REPLACE filter element and CHECK intake system for blockage. REPEAT Test Step **EPC.6**.
	Less than 2 inches H_2O ▶	CORRECT restriction in fitting on air cleaner test port. REPEAT Test Step **EPC.6**.
EPC.7 CHECK INJECTION PUMP TRANSFER PRESSURE		
• Remove screw from transfer pump pressure port cover. • Install Tool T83T-9000-A or equivalent through cover and O-ring and into port. Install adapter 5650 and Pressure Test Kit 014-00761 or equivalent. • Fittings must be tight and not leaking. • Run engine at 3,300 rpm, no load, with transmission in NEUTRAL. • Record pressure reading. • Pressure should be 90 to 110 PSI.	OK ▶	GO to **EPC.8**.
	~~OK~~ ▶	REPLACE injection pump. (REFER to Shop Manual, Section 22-08.) If performance problem still exists after installing new pump, CHECK and ADJUST injection pump dynamic timing. (REFER to adjustments in this Section.) If performance problem still exists after adjusting timing, GO to **EPC.8**.

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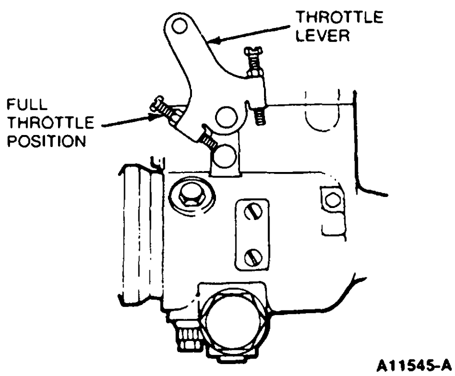
Engine Performance

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC.8 ACCELERATOR LINKAGE ADJUSTMENT		
• With engine off, check that throttle lever contacts injection pump stop at full accelerator pedal depression. Full throttle screw is not adjustable. Tampering may cause injection pump damage.  	OK ▶ ~~OK~~ ▶	GO to **EPC.9** . ADJUST or SERVICE vehicle throttle linkage as necessary. (Refer to Shop Manual, Section 24-60.) GO to **EPC.9** .
EPC.9 CHECK ENGINE IDLE SPEED		
• Check engine idle speed as described under Adjustments in this Section. • Bring engine up to normal operating temperature. • Idle speed is measured with manual transmission in NEUTRAL and automatic transmission in DRIVE. • Idle speed is shown on Vehicle Emission Control Information (VECI) decal.	OK ▶ ~~OK~~ ▶	GO to **EPC.10** . ADJUST as necessary. GO to **EPC.10** .

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Engine Performance

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC.10 DYNAMIC INJECTION PUMP TIMING**		
o Install Dynamic Timing Meter and check injection pump timing. (Refer to Dynamic Injection Pump Timing.) Measure at 2,000 rpm, no load. **Engine must be at normal operating temperature. o Record dynamic timing in Box A, Step 10 of the 7.3L Engine Performance Chart. o Apply +12 volt battery power to the injection pump timing advance solenoid and record dynamic timing in Box B, Step 10 of the 7.3L Engine Performance Chart.	B is more than 1° advanced from A, and A is within ± 2°. ▶	GO to EPC.11 .
	B is more than 1° advanced from A, and A is not within ± 2°. ▶	ADJUST timing. (REFER to Shop Manual, Section 22-08 and adjustments.) If performance problem still exists after adjusting timing, GO to EPC.11 .
	B is less than 1° advanced from A. ▶	REPLACE fuel injection pump and REPEAT EPC.10 .
EPC.11 CHECK INJECTION NOZZLES AND INLET LINES		
NOTE: Perform this check only if engine has an obvious combustion knock or miss. o Check injection nozzle inlet lines for kinks or restriction. (Refer to Shop Manual, Section 22-08.) o Test injection nozzles as described in this Section. **NOTE: Warranty claims for injection nozzles will not be accepted unless the completed Engine Performance chart is submitted with the returned parts.**	Lines and nozzles OK ▶	GO To EPC.12 .
	Lines and/or nozzles not OK ▶	REPLACE damaged injection nozzle fuel inlet lines. (REFER to Shop Manual, Section 22-08.) REPLACE injection nozzles as described in this Section and Shop Manual, Section 22-08. If performance problem still exists, GO to EPC.12 .

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TEST STEP	RESULT ▶	ACTION TO TAKE
EPC.12 CRANKCASE PRESSURE TEST		
• Remove crankcase depression regulator valve and securely plug opening to prevent blow-by. (Refer to Shop Manual, Section 22-08.) • Remove oil filler cap and install adapter 5631, and Pressure Test Kit 014-00761, or equivalent. (Refer to Pressure Test Kit Hook-Up illustration.) • Ensure dipstick is seated in dipstick tube. • Run engine at 3,300 rpm no load, with transmission in NEUTRAL. • Record pressure reading. • Pressure should not exceed 6 inches H_2O at 3,300 rpm. **NOTE: Warranty claims for injection pumps will not be accepted unless all tamper-resistant seals are intact and the completed Engine Performance Chart is submitted with the returned parts.**	OK ▶	REPLACE injection pump, and CHECK and ADJUST timing. (REFER to Shop Manual, Section 22-08 and Adjustments in this Section.)
	~~OK~~ ▶	Problem is internal to the engine. (REFER to Shop Manual, Section 22-08.)

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Fuel System Air Leak Diagnosis

Hard starting, white smoke in the normal engine operating range, poor idle quality, or lack of power under load can be caused by several conditions. One of these conditions is air leaks in the fuel supply system. This procedure is provided to assist in the diagnosis of 7.3L diesel engine fuel system air leaks.

To perform the Fuel System Air Leak Diagnosis, the following adapters (Fig. 26 and 27) need to be assembled as shown from locally available materials.

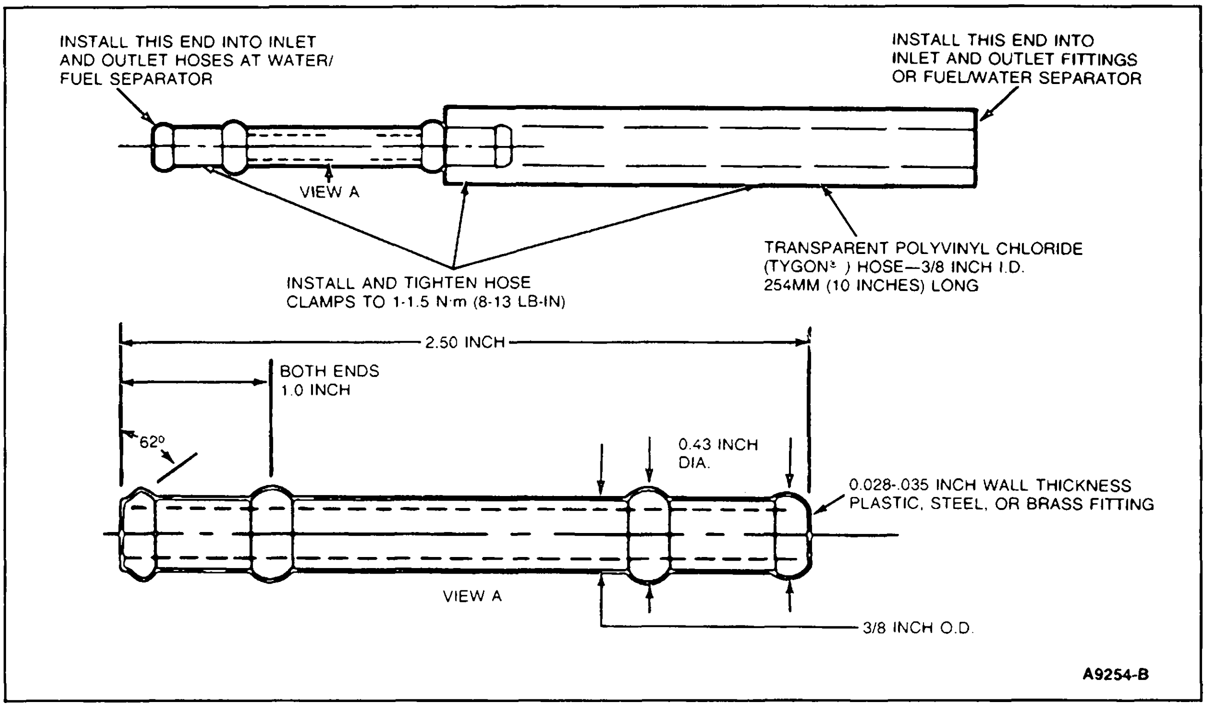

Figure 26 Water/Fuel Separator Adapter, Two Required

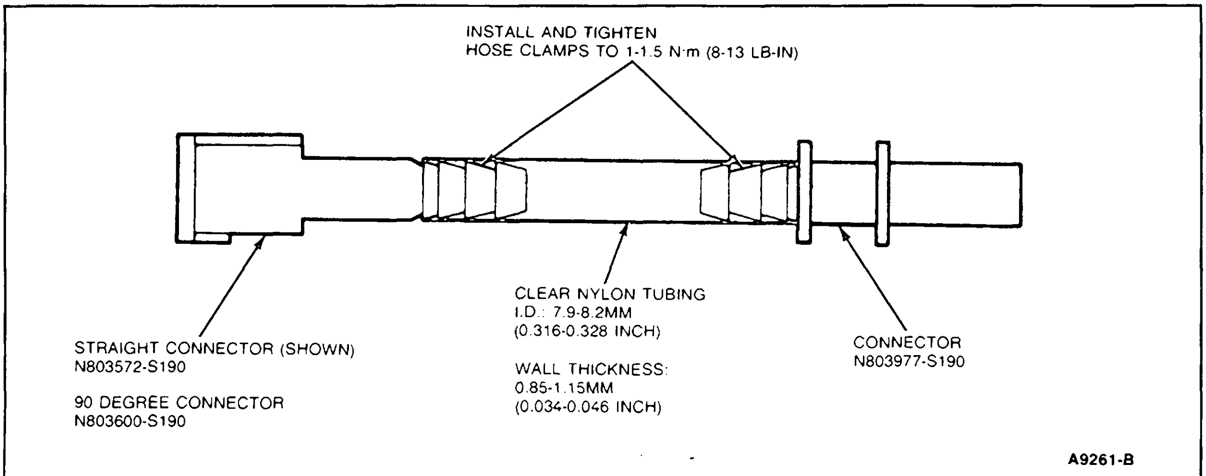

Figure 27 Selector Valve/Fuel Tank Push Connect Adapter — F-Series (Two Required)

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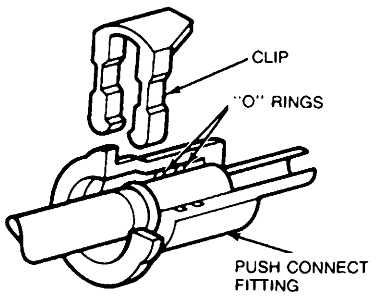
Fuel System Air Leak Diagnosis

TEST STEP	RESULT ▶	ACTION TO TAKE
J1 CHECK HOSE CONNECTIONS		
NOTE: Prior to starting the diagnostic procedure, verify that the fuel tank(s) contain at least a half tank of fuel — the fuel level compensates for the range of vehicle attitudes that may uncover the fuel sender pickup hose or sender by-pass in the fuel tank when the fuel level is low. Visually inspect the fuel system for obvious problems such as kinked hoses, damaged lines or push-connect fittings. • Verify that the push-connect fitting clip is in place. • Verify that the push-connect fittings are properly installed on the tube end by pulling the fitting away from the tube (axially along the tube). The fitting should not pull off from the tube end. If the fitting does pull away, push the fitting axially back on to the tube until a definite click is heard. • Pull and push the fitting one more time to verify proper installation.	OK ▶ ~~OK~~ ▶	GO to J2. SERVICE or REPLACE fuel lines, clamps or push-connect fittings. REFER to Light Truck Shop Manual, Volume B, Section 25-50, for push-connect fitting service.



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Fuel System Air Leak Diagnosis

TEST STEP	RESULT ▶	ACTION TO TAKE
J2 CHECK SYSTEM FOR BUBBLES OR FOAM		
∘ Remove the rubber fuel return bypass hose which connects the fuel filter outlet fitting bypass orifice to the return lines at the fuel injection nozzles. **CAUTION** **Care should be taken when removing or installing hose to the plastic fitting at the fuel injection nozzle return lines. Lubricate hose with diesel fuel to ease installation.** ∘ Install a 305mm (12-inch) length of 3/16" I.D. clear polyvinyl chloride, TYGON ® hose (to view fuel flow) in place of the above rubber fuel hose, then tighten hose clamps to 1-1.5 N·m (8-13 lb-in). ∘ Run engine at approximately 3,000 rpm for two to three minutes to clear air from the system, which was induced by the previous operation. ∘ Observe fuel hose for air bubbles at 3,000 engine rpm. ∘ Any continuous stream of bubbles larger than 1.58mm (1/16 inch) indicates air ingestion. A moving concentration of bubbles of any size, or foam, is unacceptable. **NOTE: TYGON ® is a registered trademark of Norton Industries Plastics.**	OK ▶ ~~OK~~ ▶	Problem elsewhere in system. REMOVE TYGON ® hose and INSTALL original hose. REFER to Symptom Analysis in this Section. GO to J3 .

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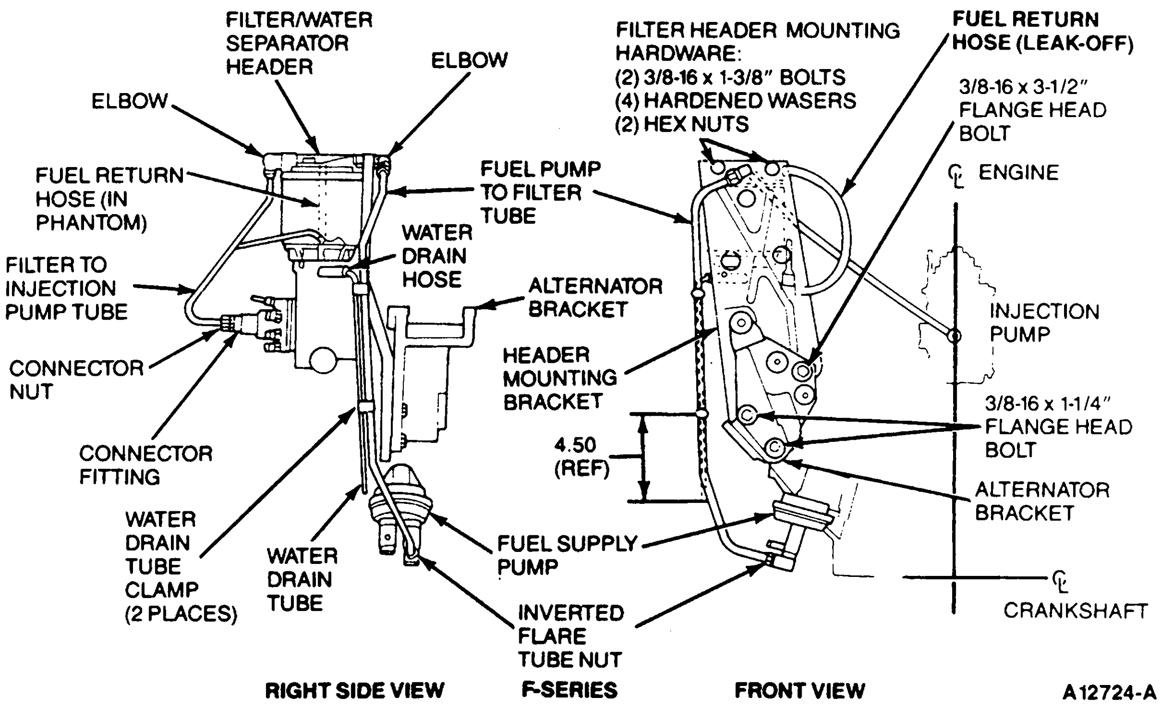
Fuel System Air Leak Diagnosis

TEST STEP		RESULT ▶	ACTION TO TAKE
J2	CHECK SYSTEM FOR BUBBLES OR FOAM (Continued)		



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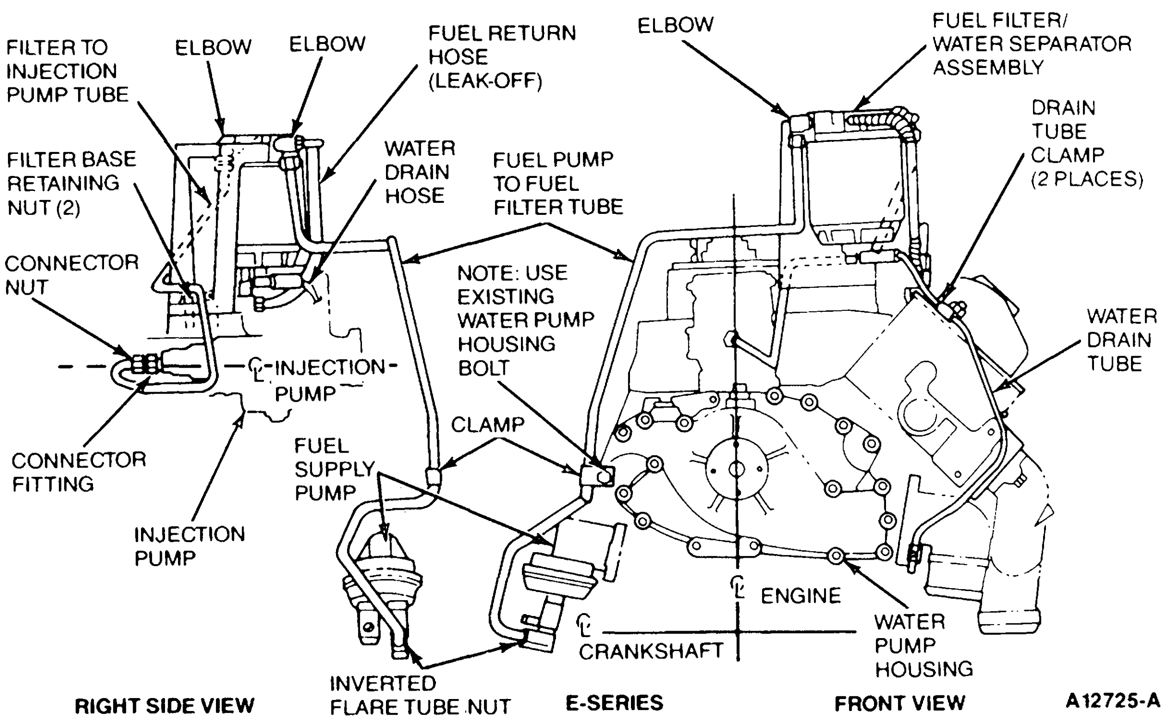
Fuel System Air Leak Diagnosis

	TEST STEP	RESULT ▶	ACTION TO TAKE
J2	CHECK SYSTEM FOR BUBBLES OR FOAM (Continued)		



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Fuel System Air Leak Diagnosis

TEST STEP	RESULT ▶	ACTION TO TAKE
J3 CHECK DIRECTION OF FLOW		
• Observe direction of flow of bubbles. Bubbles should flow from fuel filter outlet fitting to the fuel injection nozzle return system.	OK ▶	GO to J4 for single tank system. GO to J5 for dual tank system.
	~~OK~~ ▶	Fuel System is restricted. GO to Engine Performance Diagnosis in this Section. PERFORM Steps EPC.4A through EPC.4D .
J4 CHECK HOSE CONNECTIONS		
• Check for damage to hose connections at rubber fuel hose from chassis fuel line to mechanical lift pump and at inlet and outlet hoses at water separator. • Tighten hose clamps to 1-1.5 N•m (8-13 lb-in). • After tightening hose clamps, run engine for five minutes at 3,000 rpm and check for air bubbles in TYGON ® hose.	OK ▶	REPLACE TYGON ® hose with original hose. Problem resolved.
	~~OK~~ ▶	GO to J5 .

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Fuel System Air Leak Diagnosis

TEST STEP	RESULT ▶	ACTION TO TAKE
J5 CHECK FUEL FILTER/WATER SEPARATOR FOR BUBBLES		
• Disconnect fuel filter/water separator inlet hose. Install hose adapter and tighten clamps to 1-1.5 N•m (8-13 lb-in). **NOTE: Refer to Air Leak Diagnosis — Hose Adapter procedures in this Section.** • Disconnect fuel/water separator outlet hose. Install hose adapter and tighten clamps to 1-1.5 N•m (8-13 lb-in). CAUTION **Disconnect hoses and install adapters one at a time to prevent hose mix-up.** • Operate engine at 1,500 rpm for five minutes to develop steady fuel flow. Then, operate engine at 3,000 rpm for an additional two minutes and check for bubbles in hose adapters.	Air bubbles present in inlet hose, single tank system. ▶	SERVICE hoses and connections between fuel/water separator as necessary. REPEAT Test Step J5 .
	Air bubbles present in inlet hose, dual tank system ▶	GO to J6 .
	Air bubbles present in outlet hose only ▶	CHECK hose adapter at fuel/water separator inlet for air leaks. Operate water/fuel separator drain **with engine off.** REPEAT Test Step J5 . If bubbles persist, REPLACE water/fuel separator. REPEAT Test Step J2 .

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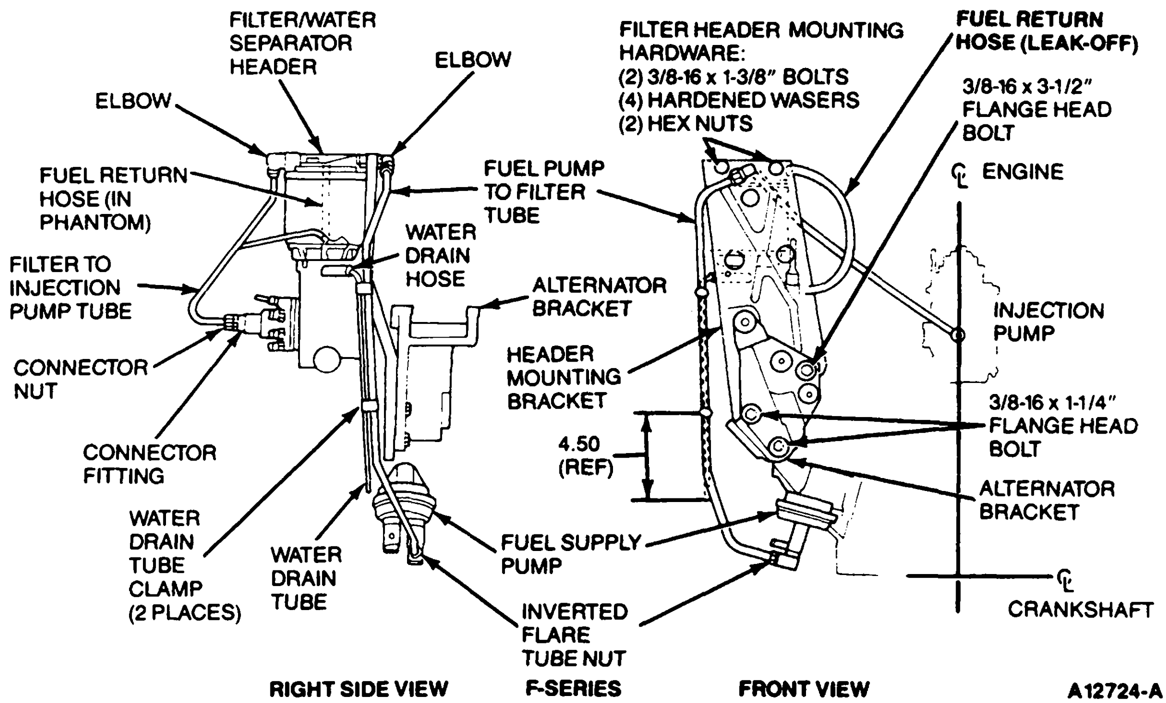
Fuel System Air Leak Diagnosis

	TEST STEP	RESULT ▶	ACTION TO TAKE
J5	CHECK FUEL FILTER/WATER SEPARATOR FOR BUBBLES (Continued)		



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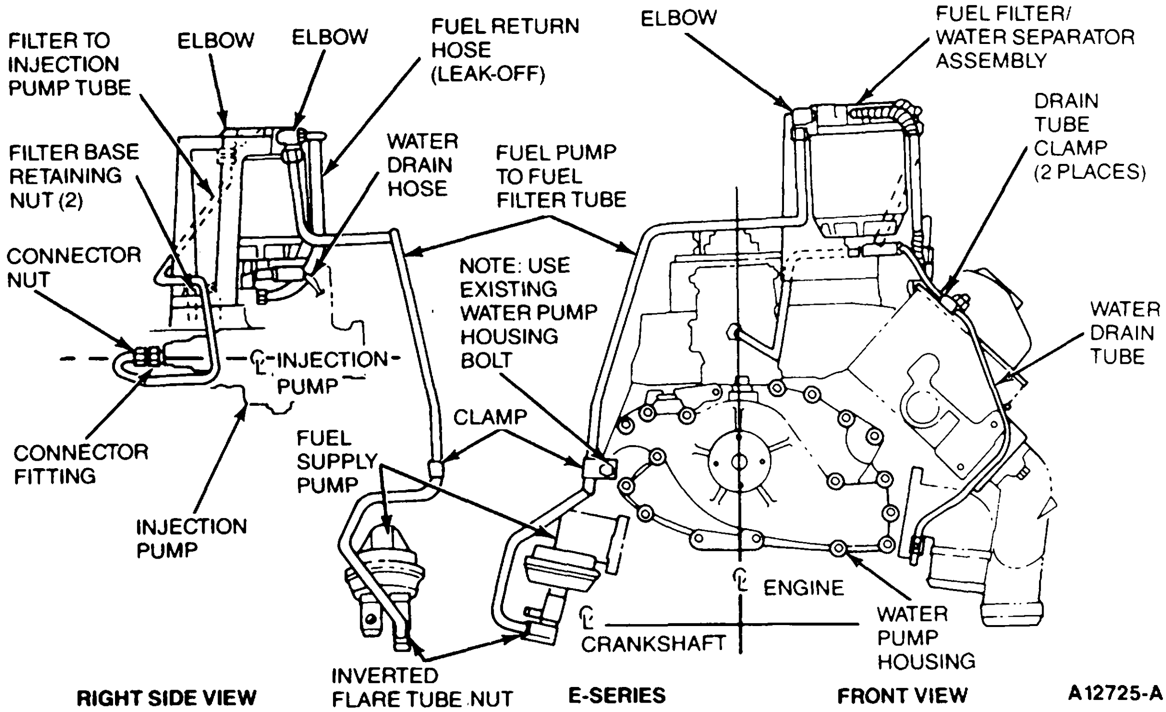
Fuel System Air Leak Diagnosis

	TEST STEP	RESULT ▶	ACTION TO TAKE
J5	CHECK FUEL FILTER/WATER SEPARATOR FOR BUBBLES (Continued)		



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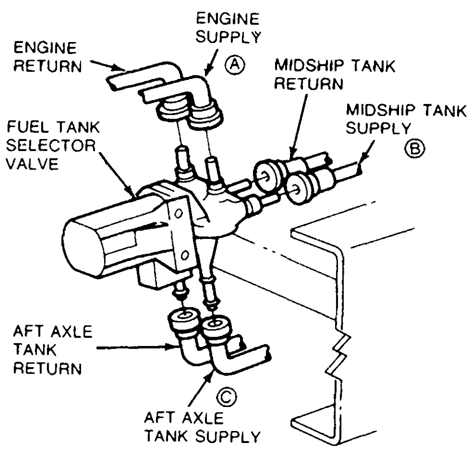
Fuel System Air Leak Diagnosis

TEST STEP	RESULT ▶	ACTION TO TAKE
J6 OPERATE SELECTOR VALVE — DUAL TANKS		
• Start and run engine. • Observe TYGON® hose while switching selector valve between tanks.	Bubbles present in both tank positions ▶	GO to J4 .
	Bubbles present in only one tank position ▶	GO to J7 .
J7 CHECK SELECTOR VALVE CONNECTIONS		
• Check push-connect fittings for tightness as outlined in Test Step J1 . • Fittings should be tight.	OK ▶	GO to J8 .
	~~OK~~ ▶	SERVICE push-connect fittings, as necessary. REFER to Shop Manual, Section 25-50 for push-connect fitting service.
J8 BY-PASS SELECTOR VALVE		
• Disconnect push-connect fittings from fuel tank selector valve for affected tank. • Install push-connect fitting adapters between fuel lines and selector valve. • Run engine at 3,000 rpm for two to three minutes to clear any air ingested during adapter installation. Run engine an additional one to two minutes and observe transparent fuel lines in adapters.	Bubbles not present in either adapter ▶	Air leak is between fuel tank selector valve and water/fuel separator. SERVICE fuel lines and connections as necessary. REPEAT Test Step J2 .
 1. INSTALL ONE ADAPTER AT POINT A 2. INSTALL OTHER ADAPTER AT: POINT B FOR MIDSHIP TANK POINT C FOR AFT AXLE TANK A11549-A	Bubbles present in both adapters ▶	Air leak is between fuel tank and selector valve. SERVICE fuel lines and connections as necessary. REPEAT Test Step J2 .
	Bubbles present in selector valve outlet adapter only. ▶	REPLACE fuel tank selector valve. REPEAT Test Step J2 .

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Injection Nozzle Testing

Where ideal conditions of good combustion, specified engine temperature control, and absolutely clean fuel prevail, nozzles require little attention. Nozzle trouble is usually indicated by one or more of the following symptoms:

- Smoky exhaust (black)
- Loss of power
- Misfiring
- Increased fuel consumption
- Combustion Knock
- Engine Overheating

When faulty nozzle operation is suspected on an engine that is misfiring or puffing black smoke, a simple test can be made to determine which cylinder(s) is causing the problem.

- Run the engine at the rpm which makes the problem most pronounced.
- Momentarily loosen the high-pressure fuel inlet line connection on one nozzle assembly one-half to one turn. Then, tighten connection to specification.
- Check each cylinder in the same manner.
- If one nozzle is found where loosening makes no difference in the misfiring, or the puffing black smoke stops, that nozzle should be tested. Test only the suspect nozzle(s).

Remove suspect nozzles as outlined in Shop Manual, Section 22-08. After removing nozzle(s) from the engine, the Injection Nozzle Test should be performed. This test will provide valuable information regarding the condition of the nozzle(s). A clean workbench, clean washing fluid containers, clean tools, and clean hands are all essential to produce satisfactory results.

NOTE: It is advisable to test the nozzles before cleaning them.

Figure 28 shows the Rotunda Injection Nozzle Tester, 014-00300, used for this test.

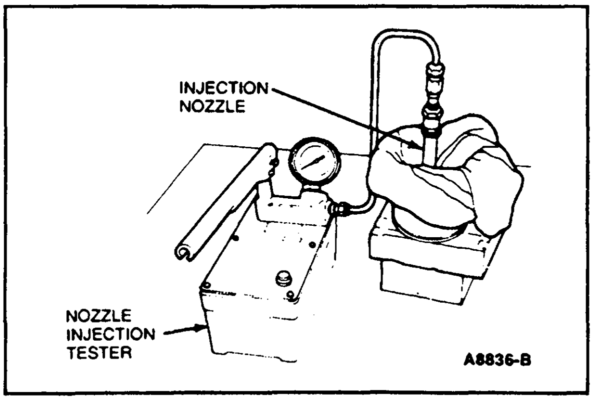

Figure 28 Injection Nozzle Tester 014-00300

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Injection Nozzle Testing

NOTE: Perform this check only if engine has an obvious combustion knock or miss.

1. Prepare stand for making tests. Fill stand reservoir with clean Calibration Fluid. Open tester valve slightly and operate tester handle to expel air from tester and outlet pipe. Operate tester until solid fluid (without air bubbles) flows from end of outlet pipe. Close tester valve.

2. Connect injection nozzle to test stand. Care should be taken to. avoid cross-threading. Tighten connector nut securely with end wrench. Nozzle Adapter which is supplied with tester 014-00300 has RH thread to nozzle assembly and LH thread to tester piping.

3. Bleed air from nozzle. Open stand valve and operate tester handle for 8 to 10 quick strokes to expel (bleed) air from injection nozzle. Fluid should discharge from the spray hole in nozzle tip.

WARNING

ALWAYS WEAR APPROVED SAFETY GLASSES WHEN OPERATING THE TESTER. VOLATILE LIQUIDS CAN BE EXTREMELY FLAMMABLE WHEN VAPORIZED. AVOID ANY CONDITIONS (SPARKS, OPEN FLAMES, LIT CIGARETTES, ETC.) WHICH MIGHT IGNITE THE FLUID USED DURING THE TEST PROCEDURE. THE ONLY LIQUID APPROVED FOR USE IN THIS TESTER IS SAE CALIBRATION NO. 208629, OR EQUIVALENT CALIBRATION FLUID (SAE J968D OR ISO 4113).

WHEN A NOZZLE IS BEING TESTED OR IS IN OPERATION, KEEP HANDS AND OTHER PARTS OF THE BODY AWAY FROM THE NOZZLE. THE LIQUID DISCHARGE LEAVES THE NOZZLE TIP WITH SUFFICIENT FORCE TO PENETRATE THE SKIN AND CAUSE SERIOUS INJURY. THE NOZZLE TIP SHOULD BE ENCLOSED IN A TRANSPARENT RECEPTACLE IF AVAILABLE.

4. Check nozzle opening pressure. Close pump valve, and operate pump handle in slow even strokes to bring system up to pressure. Record highest pressure reached before nozzle opens. Repeat operation, increasing handle speed if necessary to establish consistant readings. Refer to Fig. 29 for nozzle opening pressures.

NOTE: Disregard tip leakage during this test.

NOTE: Spray pattern testing is not required.

NEW		USED (MINIMUM)	
kPa	PSI	kPa	PSI
12,928 ± 517	1,875 ± 75	9,825	1,425

1 CALIBRATION CODE: 468J-R00 AND 468X-ROD.

2 BE SURE TO USE INJECTORS WITH STAMPED CODE "B" OR "BB"

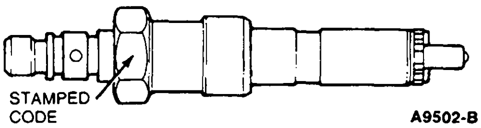

Figure 29 Nozzle Opening Pressure

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Injection Nozzle Testing

5. Check for tip leakage. Blow nozzle tip dry using filtered compressed air. Operate test pump to maintain pressure at about 1378 kPa (200 psi) below the opening pressure obtained in Test 1. Wetting of the nozzle tip is acceptable as long as a drop does not fall, within five seconds (Fig. 30).

NOTE: Make sure that any accumulation at the nozzle tip is not due to test fluid leaking down the outside of the nozzle body from the return openings. If questionable, wrap a shop cloth around the nozzle body to prevent fluid leaking down the outside of the nozzle body from reaching the tip.

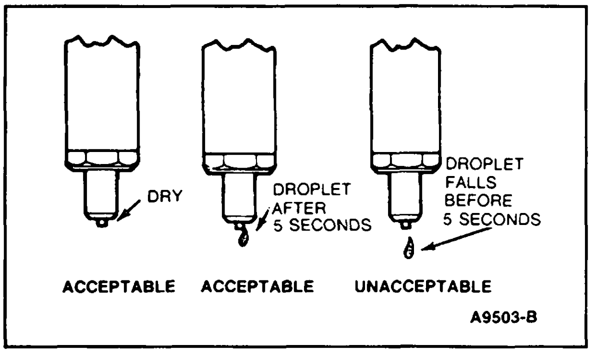

Figure 30 Nozzle Leakage Patterns

6. After testing is completed, make sure to open the pump valve to release the built up pressure prior to removing the nozzle from the tester. When nozzle is removed, cap the nozzle tip and inlet until installed back in engine.

NOTE: If nozzle passes the nozzle opening pressure and tip leakage tests, it is suitable for further service in the engine.

NOTE: Nozzles showing leakage at nozzle tip spray hole or opening pressure below the minimum permissible limit, are damaged or worn and must be replaced, if within warranty coverage. Servicing the nozzle(s) (disassemble, clean and rebuild) instead of replacement to correct nozzle tip leakage or low opening pressure is only permissible beyond the warranty period if so desired.

NOTE: Warranty claims for replacement of the nozzle(s) will not be accepted unless the completed Engine Performance (Diagnostic) Chart is submitted with the returned part(s).

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INTRODUCTION

Most threaded fasteners are covered by specifications that define required mechanical properties, such as tensile strength, yield strength, proof load and hardness. These specifications are carefully considered in initial selection of fasteners for a given application. To assure continued satisfactory vehicle performance, replacement fasteners used should be of the correct strength, as well as the correct nominal diameter, thread pitch, length, and finish.

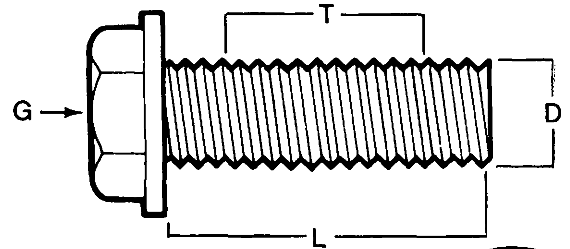
Most original equipment fasteners (English system or Metric) are identified with markings or numbers indicating the strength of the fastener. These markings are described in the pages that follow. Attention to these markings is important in assuring that the proper replacement fasteners are used.

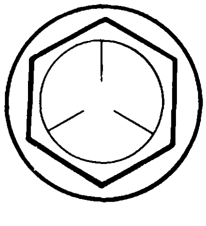
Further, some metric fasteners, especially nuts, are colored blue. This metric blue identification is in most cases a temporary aid for production start-up, and color will generally revert to normal black or bright after start-up.

English system and metric system fasteners are available through your Ford Parts and Service operation.

NOMENCLATURE FOR BOLTS

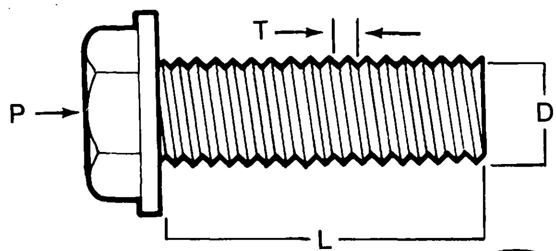
(ENGLISH) INCH SYSTEM
Bolt, 1/2-13x1

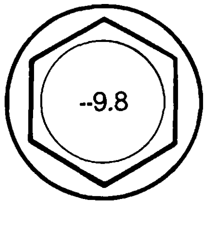




G—Grade Marking (bolt strength)
L—Length, (inches)**
T—Thread Pitch (thread/inch)
D—Nominal Diameter (inches)

METRIC SYSTEM
Bolt M12-1.75x25





P—Property Class* (bolt strength)
L—Length (millimeters)**
T—Thread Pitch (thread width crest to crest mm)
D—Nominal Diameter (millimeters)

*The property class is an Arabic numeral distinguishable from the slash SAE English grade system.
**The length of all bolts is measured from the underside of the head to the end.

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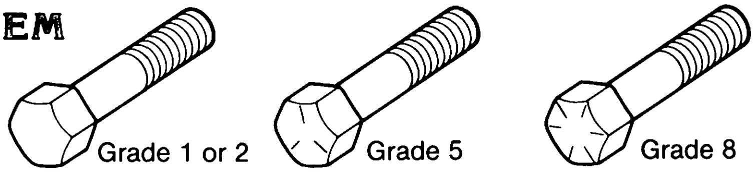
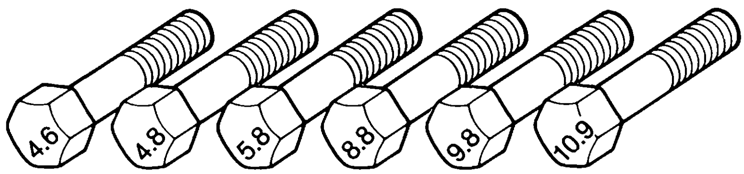
BOLT STRENGTH IDENTIFICATION

(ENGLISH) INCH SYSTEM



English (Inch) bolts—Identification marks correspond to bolt strength—increasing number of slashes represent increasing strength.

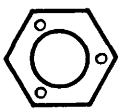
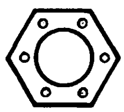
METRIC SYSTEM



Metric bolts—Identification class numbers correspond to bolt strength—increasing numbers represent increasing strength. Common metric fastener bolt strength property are 9.8 and 10.9 with the class identification embossed on the bolt head.

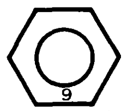
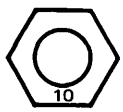
HEX NUT STRENGTH IDENTIFICATION

(ENGLISH) INCH SYSTEM

Grade	Hex Nut Grade 5	Hex Nut Grade 8
Identification	 3 Dots	 6 Dots

Increasing dots represent increasing strength.

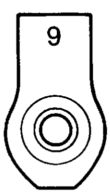
METRIC SYSTEM

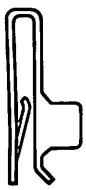
Class	Hex Nut Property Class 9	Hex Nut Property Class 10
Identification	 Arabic 9	 Arabic 10

May also have blue finish or paint daub on hex flat. Increasing numbers represent increasing strength.

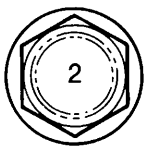
OTHER TYPES OF PARTS

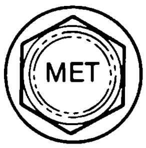
Metric identification schemes vary by type of part, most often a variation of that used of bolts and nuts. Note that many types of English and metric fasteners carry no special identification if they are otherwise unique.



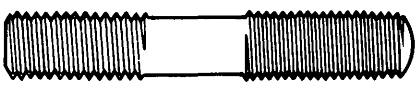


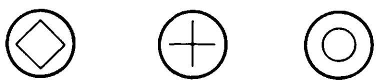
—Stamped U-Nuts





—Tapping, thread forming and certain other case hardened screws





CLASS 10.9 CLASS 9.8 CLASS 8.8

—Studs, Large studs may carry the property class number. Smaller studs use a geometric code on the end.

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ENGLISH METRIC CONVERSION

Description	Multiply	By	For Metric Equivalent
ACCELERATION	Foot/sec^2	0.304 8	metre/sec^2 (m/s^2)
	Inch/sec^2	0.025 4	metre/sec^2
TORQUE	Pound-inch	0.112 98	newton-metres (N·m)
	Pound-foot	1.355 8	newton-metres
POWER	horsepower	0.746	kilowatts (kw)
PRESSURE or STRESS	inches of water	0.2488	kilopascals (kPa)
	pounds/sq. in.	6.895	kilopascals (kPa)
	pounds/sq. in.	1	bar
ENERGY or WORK	BTU	1 055.	joules (J)
	foot-pound	1.355 8	joules (J)
	kilowatt-hour	3 600 000. or 3.6×10^6	joules (J = one W's)
LIGHT	foot candle	10.76	lumens/metre^2 (lm/m^2)
FUEL PERFORMANCE	miles/gal	0.425 1	kilometres/litre (km/l)
	gal/mile	2.352 7	litres/kilometre (l/km)
VELOCITY	miles/hour	1.609 3	kilometres/hr. (km/h)
LENGTH	inch	25.4	millimetres (mm)
	foot	0.304 8	metres (m)
	yard	0.914 4	metres (m)
	mile	1.609	kilometres (km)
AREA	inch^2	645.2	millimetres^2 (mm^2)
		6.45	centimetres^2 (cm^2)
	foot^2	0.092 9	metres^2 (m^2)
	yard^2	0.836 1	metres^2
VOLUME	inch^3	16 387.	mm^3
	inch^3	16.387	cm^3
	quart	0.016 4	litres (1)
	quart	0.946 4	litres
	gallon	3.785 4	litres
	yard^3	0.764 6	metres^3 (m^3)
MASS	pound	0.453 6	kilograms (kg)
	ton	907.18	kilograms (kg)
	ton	0.90718	tonne
FORCE	kilogram	9.807*	newtons (N)
	ounce	0.278 0	newtons
	pound	4.448	newtons
TEMPERATURE	degree farenheit	0.556 (°F -32)	degree Celsius (°C)

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DECIMAL AND METRIC EQUIVALENTS

Fractions	Decimal Inch	Metric mm
1/64	.015625	.397
1/32	.03125	.794
3/64	.046875	1.191
1/16	.0625	1.588
5/64	.078125	1.984
3/32	.09375	2.381
7/64	.109375	2.778
1/8	.125	3.175
9/64	.140625	3.572
5/32	.15625	3.969
11/64	.171875	4.366
3/16	.1875	4.763
13/64	.203125	5.159
7/32	.21875	5.556
15/64	.234375	5.953
1/4	.250	6.35
17/64	.265625	6.747
9/32	.28125	7.144
19/64	.296875	7.54
5/16	.3125	7.938
21/64	.328125	8.334
11/32	.34375	8.731
23/64	.359375	9.128
3/8	.375	9.525
25/64	.390625	9.922
13/32	.40625	10.319
27/64	.421875	10.716
7/16	.4375	11.113
29/64	.453125	11.509
15/32	.46875	11.906
31/64	.484375	12.303
1/2	.500	12.7

Fractions	Decimal Inch	Metric mm
33/64	.515625	13.097
17/32	.53125	13.494
35/64	.546875	13.891
9/16	.5625	14.288
37/64	.578125	14.684
19/32	.59375	15.081
39/64	.609375	15.478
5/8	.625	15.875
41/64	.640625	16.272
21/32	.65625	16.669
43/64	.671875	17.066
11/16	.6875	17.463
45/64	.703125	17.859
23/32	.71875	18.256
47/64	.734375	18.653
3/4	.750	19.05
49/64	.765625	19.447
25/32	.78125	19.844
51/64	.796875	20.241
13/16	.8125	20.638
53/64	.828125	21.034
27/32	.84375	21.431
55/64	.859375	21.828
7/8	.875	22.225
57/64	.890625	22.622
29/32	.90625	23.019
59/64	.921875	23.416
15/16	.9375	23.813
61/64	.953125	24.209
31/32	.96875	24.606
63/64	.984375	25.003
1	1.00	25.4

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TORQUE CONVERSION

NEWTON METRES (N·m)	POUND-FEET (LB-FT)
1	0.7376
2	1.5
3	2.2
4	3.0
5	3.7
6	4.4
7	5.2
8	5.9
9	6.6
10	7.4
15	11.1
20	14.8
25	18.4
30	22.1
35	25.8
40	29.5
50	36.9
60	44.3
70	51.6
80	59.0
90	66.4
100	73.8
110	81.1
120	88.5
130	95.9
140	103.3
150	110.6
160	118.0
170	125.4
180	132.8
190	140.1
200	147.5
225	166.0
250	184.4

POUND-FEET (LB-FT)	NEWTON METRES (N·m)
1	1.356
2	2.7
3	4.0
4	5.4
5	6.8
6	8.1
7	9.5
8	10.8
9	12.2
10	13.6
15	20.3
20	27.1
25	33.9
30	40.7
35	47.5
40	54.2
45	61.0
50	67.8
55	74.6
60	81.4
65	88.1
70	[illegible]4.9
75	101.7
80	108.5
90	122.0
100	135.6
110	149.1
120	162.7
130	176.3
140	189.8
150	203.4
160	216.9
170	230.5
180	244.0

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